

*Materials for a Flora of the Malayan Peninsula*, No. 24.—By J.  
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*Indian Forest Department.*

This Part contains the Families Nos. 96 Nepenthaceæ, 98 Piperaceæ, 104 Proteaceæ and 107 Loranthaceæ. The account of the Family of the Nepenthaceæ has most kindly been contributed by Prof. J. M. Macfarlane, Director of the Botanic Garden at the University of Philadelphia, U. S. America, author of the Monograph of the Family in Engler's *Pflanzenreich*. The account of the large Family of the Piperaceæ is due to the kindness of Monsieur C. de Candolle of Geneva. The other two Families are my own work.

The new species in the Piperaceæ, 54 in number, were published as Part No 1 in Vol. VI of the Records of the Botanical Survey of India. Three new species in Proteaceæ, by Lieut.-Col. Sir D. Prain, C.M.G., C.I.E., F.R.S., Director of the Royal Gardens, Kew, and two by myself have been published in the Kew Bulletin, as well as 6 new species in Loranthaceæ. The total number of new species is thus 65.

Family XCVI. NEPENTHACEÆ.

By J. M. MACFARLANE.

Suffrutescent or frutescent, climbing, rarely erect or prostrate plants. *Stem* cylindric to trigonous. *Leaves* alternate, sessile or petiolate, often decurrent, divisible into basal lamina, excurrent tendriform midrib, terminal inflated ascidiform midrib usually bearing ciliate laminar wings, also with orifice bounded by a corrugated peristome and lid at first closing but later arching over pitcher orifice; lamina and specially pitcher glandular, adapted for the attraction and catching of insects. *Inflorescence* a raceme of cymes condensing usually to a simple raceme, with small green, yellow or claret-coloured often ebracteate flowers. *Flowers* dioecious, regular, monochlamydeous. *Sepals* 4, rarely 3, in decussate pairs, glandular and nectariferous within, persistent. *Stamens* monadelphous, anthers rarely indefinite or 6—4, usually 12—8, aggregate into a globose mass. *Pistil* of 4, rarely 3, synarpous carpels; ovary oval to ovate, usually hairy, 4—3-celled with numerous minute ovules; style short or absent; stigma 4—3-lobed. *Fruit* a leathery or subwoody loculicidal capsule. *Seeds* small, albuminous, with membranous filiform

bicaudate testa and embryo in axis of albumen.—DISTRIB. Madagascar to Philippine Islands and N. Australia; one genus with about 65 species.

NEPENTHES, Linn.

Characters as given above.

- Inflorescence a raceme of paniculate cymes; pitcher lid small, reflexed .. .. . 1. *N. ampullaria*.
- Inflorescence a raceme, pedicels 3—1-flowered.
- Longitudinal leaf-veins 2 to 4 pairs.
- Leaves sessile, more or less amplexicaul, non-decurrent.
- Leaf-veins 2 pairs, marginal, obscure, pitcher elongate with white tomentose collar below the corrugated, peristome .. 2. *N. albo-marginata*.
- Leaf-veins 3 pairs, marginal, obscure, pitcher elongate with dull tomentose collar below the peristome .. .. 3. *N. gracillima*.
- Leaf-veins 4 pairs, disposed between rib and margin, lid glabrous within; pedicels usually 1-flowered .. .. 4. *N. singalana*.
- Leaf-veins 4, rarely 5, pairs, disposed between rib and margin, lid glabrous within; pedicels 3—2-flowered at least below .. 5. *N. sanguinea*.
- Leaf-veins 4 pairs, lid with long rigid hairs within; pedicels biflorous, bracteolate .. 6. *N. Macfarlanei*.
- Leaves sessile, decurrent, leaf-veins 2, rarely 3 pairs; pedicels biflorous below, uniflorous above .. .. 7. *N. Reinwardtiana*.
- Longitudinal leaf-veins 5—6 pairs.
- Leaves sessile, amplexicaul, decurrent; peristome uniform, narrow .. .. 8. *N. gracilis*.
- Leaves petiolate; peristome of pitcher elongated posteriorly into a high neck .. .. 9. *N. Rafflesiana*.
- Longitudinal leaf-veins 7—10 pairs.
- Leaves petiolate, herbaceous, margin delicately ciliate-dentate .. .. 10. *N. phyllamphora*.

1. NEPENTHES AMPULLARIA, Jack in Comp. Bot. Mag. I. 271 (1835). A tall climbing shrub, sometimes with prostrate branches. *Stem* 12—20 m. high, cylindrical, ferrugineo-tomentose when young, at length brown glabrous, internodes usually elongated. *Leaves* 10—35 cm. long, 4—9 cm. broad, petiolate, half-amplexicaul; petiole winged, gradually expanding into a lamina; lamina lanceolate to obovate, ferrugineo-tomentose when young at length glabrous, sparsely hairy beneath; longitudinal veins 4, rarely 3 pairs, parallel, united by oblique parallel nerves; leaves on prostrate branches often crowded

reduced, with clustered richly-coloured pitchers; tendril 5—8 cm. long, hirsute; pitchers usually small, 3—5 cm. long, 2—3 cm. broad, often larger on prostrate shoots, ventricose to subcylindric, green to purple-green, often blotched or marbled with claret; wings broad with doubly-ciliate margins; peristome transverse, narrow and recurved outwardly, wide and obliquely descending within, green, or purple-striped, lid narrow elliptic, reflexed, eglandular; pitcher within uniformly glandular, shining. *Inflorescence* 15—35 cm long; raceme of many dense 2—5-flowered ferrugineo-tomentose cymes. *Sepals* 4, external pair larger, yellow-green, glandular within. *Staminal column* shorter than sepals, glabrous, anthers 12—8. *Ovary* ovoid,  $\pm$  tetragonous, stigmatic lobes triangular. *Capsule* 2.5—3 cm. long, pubescent to subglabrous. *Seeds* 12—15 mm. long. Korthals Verh. Nat. Gesch. Bot. 39, t. 13; Hook. f. in Bot. Mag. t. 5109 and in DC. Prodr. XVII. 93; André in Ill. Hort. XXIV. 45, t. 272; Hook. f. Fl. Br. Ind. V. 69; Macfar. in Engl. Pfl.-reich IV. iii. 33, t. 13. *N. ampullacea*, Low Sarawak 69; Miq Fl. Ind. Bat. I. i. 1076.

PERAK: at Larut, *Kunstler* 4087!, 4148!, 6222!; at 100—300 ft. alt. *Wray* 600!, 1794; at Ipoh, *Curtis*!. MALACCA: at Padang Batu on Mt. Ophir and Ayer Punas, *Cuming*!; *Griffith*!. JOHORE: *Burbidge*; *Jensen*. SINGAPORE: *Jack*!; *Wallich* 2243!; *Maingay* K.D. 1322!; *T. Anderson* 161!, 163!, 164!, 166!. BINTANG: *Jack*!; *Wallich*!.—DISTRIB. Malaya to Sumatra, Borneo and N. Guinea.

2. *NEPENTHES ALBO-MARGINATA*, Lobb in Gard. Chron. (1849) 580. A slender climbing shrub. *Stem* 5—10 m. high, subcylindric to trigonous, densely white to grey stellate-pubescent when young, at length almost glabrous, internodes short below, elongating upwards. *Leaves* 10—30 cm. long, 1—4 cm. broad; broadly amplexicaul, scarcely decurrent, expanding from a subpetiolate base into an elliptic-lanceolate lamina, above and below stellate-pubescent, at length glabrous, margin ciliate, revolute in drying; longitudinal veins 2 pairs, obscure; transverse nerves few, reticulate; tendril short; pitcher 5—15 cm. long, 1.5—3 cm. broad, green and purple-striated or almost purple, subdimorphic; lower pitchers subventricose below, cylindrical above, with expanded ciliate wings, upper tubular with shallow non-ciliate wings or ridges, peristome cylindric, uniform, sharply striate, purple-green to purple, bounded below externally by a grey or white tomentose collar; lid 1.5—2.5 cm., ovate to orbicular, richly glandular within; spur simple or 2—3-fid. *Inflorescence* 20—30 cm. long, racemose, loosely flowered, lower pedicels 2 upper

1-flowered. *Sepals* 4, elliptic, tomentose without, glandular within. *Staminal column* equal to sepals, tomentose, anthers 12—8. *Ovary* tomentose. *Capsule* 2.5—3 cm. long, valves attenuate, truncate at apex. *Seeds* 12 mm. long. Hook. f. in Trans. Linn. Soc. XXII. 422, t. 73; Masters in Gard. Chron. (1872) 542; Hook. f. in DC. Prod. XVII. 102 and Fl. Br. Ind. V. 70; Burbidge in Garden XVI, 542 ic. col; Macfar. in Engl. Pfl-reich IV. iii. 37. *N. tomentella* and *N. Teysmanniana*, Miq. Fl. Ind. Bat. I. i. 1073, 1075.

PENANG: *King's Collector* 1720!, 1723!, alt. 2000—2700 ft. at Penara Bukit, *Curtis' Collector*!, probably also *Wallich* 2244!; *Lobb*!; *Walker* 13!, alt. 2000 ft., *Hullett* 163!. PERAK: at Larut, *King's Collector* 2022!, alt. 800 ft. MALACCA: on Mount Ophir, *Lobb*!; *Hullett* 872!; *Whitehead*.—DISTRIB. Malaya to Sumatra and Borneo.

3. *NEPENTHES GRACILLIMA*, Ridley in Journ. Linn. Soc. XXXVIII 320 (1908). A slender climbing shrub. *Stem* trigono-cylindric, glabrous. *Leaves* 5—10 cm. long, 1—1.5 cm. broad; sessile, half amplexicaul, coriaceous, lanceolate, glabrous; longitudinal veins 3 pairs united by reticulate transverse nerves; tendril slender below thickened towards pitcher; pitchers 5—10 cm. long, 1—1.5 cm. broad, subcylindric, widest at middle, pale green with elongated purple areolae, wings narrow, sparsely ciliate above, reduced to shallow non-ciliate ridges below; peristome uniform, cylindric, oblique, elevated posteriorly, faintly striate, bounded below by a dull densely tomentose external collar; lid 1—1.5 cm., ovate, with large circular glands within; spur simple, recurved; pitcher within smooth glaucous purple above, glandular and shining over lower half. *Inflorescence* 12—20 cm long; raceme shorter than peduncle, slender; pedicels 1-flowered, bracteolate. *Sepals* oval, densely tomentose without and along inner margin. *Staminal column* equal to sepals, pubescent below, glabrous above, anthers 8—6. Female flower unknown. *Capsule* 14—15 mm. long, fusiform, valves lanceolate, sparsely pubescent.

PAHANG: at Telom. *Ridley* 13704!; on Mt. Gunong Taban about 3000 ft. alt., *Robinson and Wray* 5309!.

4. *NEPENTHES SINGALANA*, Beccari Malesia III 12. t. 3 (1886). A terrestrial or epiphytic climbing shrub, often drying brown black. *Stem* 2—3 m. high, 3—4-gonous, pubescent, at length glabrous. *Leaves*

6—20 cm. long, 2.5—4.5 cm. broad, sessile, widely amplexicaul, coriaceous, elliptic-lanceolate, pilose at apex and base when young, at length glabrous; longitudinal veins 4, rarely 3 or 5 pairs, transverse nerves obscure, irregularly reticulate; tendril 15—25 cm. long, thickened upwards towards pitcher; pitchers subdimorphic, lower cylindric-ventricose with narrow ciliate or dentate wings, upper cylindric with shallow wings or ridges; peristome cylindric, transverse or slightly oblique, finely striate; lid 2.5—4 cm. cordate-orbicular, glabrous, with immersed glands on the inner side; pitcher within glaucous purple over upper, glandular over lower half. *Inflorescence* 10—25 cm. long; raceme with 1- rarely 2-flowered pedicels. *Sepals* 4, margins tomentose. *Staminal column* longer than sepals, glabrous; anthers 12—10. *Capsule* 15—20 mm. long, brown, shining. *Seeds* 12—15 mm. long. Ridley in Journ. Linn. Soc. XXXVIII. 320 (1908) under name *N. Bongso*. Macfar. in Engl. Pfl.-reich IV. iii. 47.

PAHANG: on Mount Gunong Tahan, *Robinson and Wray* 5411; at 5000 ft. alt.—DISTRIB. Malaya, Sumatra.

5. *NEPENTHES SANGUINEA*, Lindl. in Gard. Chron. (1849) 580, f. 2. A terrestrial or epiphytic climbing shrub. *Stem* 2—7 m. long, trigonous, glabrous, apex pubescent, internodes short. *Leaves* 12—45 cm. long, 3—6 cm. broad, sessile, widely amplexicaul, lanceolate oblong, glabrous or slightly hairy beneath; longitudinal veins 4 rarely 5, obscure, parallel, united by obscure radiating nerves; tendril 10—20 cm. long,  $\pm$  pubescent; pitchers 10—30 cm. long, 5—8 cm. broad, subdimorphic, lower cylindric-ventricose, often greenish red to red, with expanded ciliate wings, upper cylindric to infundibuliform, reddish green or yellow-green and red spotted, with narrow usually non-ciliate wings or ridges; peristome narrowed anteriorly and posteriorly, widely expanded and sharply striate postero-laterally; lid 3—10  $\times$  2—8 cm. ovate-cordate, glandular within; pitcher within glaucous or purplish over upper half, yellow shining and glandular over lower half. *Inflorescence* 20—60 cm. long; raceme lax, pedicels delicate grey pubescent, lower 3—2-flowered upper 1-flowered. *Sepals* 4, reddish purple and glandular within. *Staminal column* pubescent below, glabrous above, anthers 8. *Ovary* quadrangular, pubescent. *Capsule* 16—25 mm. long. *Seeds* 8—12 mm. long. Griff. Not. IV. 348; Masters in Gard. Chron. (1872) 542; Hook. f. in DC. Prodr. XVII. 100 and Fl. Br. Ind. V. 70; W. G. Smith in Flor. Mag. (1874) t. 128; Planchon in Fl. d. Serr. XXII. 166, f. 2343; Veitch ort. Veitch. 303; Macfar. in Engl. Pfl.-reich IV. iii. 45. *N. pumila*,

Griff. Not. IV. 349; not *N. sanguinea* in Gard. Chron. (1882) II. 809 = *N. Veitchii*.

PERAK: *Wray* 129!; *Burbridge* on Taiping hills; *Engler* 5332!; hills near Larut, *King's Collector* 2022!, about 800 ft. elev., 2635!, at 2500—4000 ft. elev., 3307!, at 4600 ft. 3316!; Gunong Batu Putih, *King's Collector* 8018! at 3000—4000 ft.; on Maxwell's Hill 4400 ft. alt. *Fox* 183!; at Bujong Malacca, 4000 ft. alt. *Curtis* 3362!. PAHANG: at Kluang Terbang, *Barnes* 10912!. SELANGOR: at Bukit, *Kensall*!. MALACCA: at Gunong Ladong or Mount Ophir, *Griffith* 4411!; on Mount Ophir, *Lobb* 169!; *Ridley* 3174!; *Whitehead*. SINGAPORE: at Bubo, *Murton* 35! at 5000 ft.—DISTRIB. Malaya?, Borneo (*Burbridge*).

6. NEPENTHES MACFARLANEI, Hemsley in Proc. Linn. Soc. (1905) 12, in Gard. Chron. s. 3, XXXVII (1905) 241, 260, in Hook. Icon. Pl. XXIX tt. 2814, 2815 (1906). A low climbing often epiphytic shrub. *Stem* 2—3 m. high, trigonous, grooved, ferrugineo-hirsute when young. *Leaves* 6—20 cm. long, 2—3.5 cm. broad; sessile, semi-amplexicaul, ovate-lanceolate to obovate, glabrous or sparsely hairy along upper midrib; longitudinal veins 4 pairs, innermost starting one-third up from leaf base, transverse nerves obscure irregularly reticulate; tendril 10—20 cm. long uniform; pitchers 8—15 cm. long, 2.5—4 cm. broad, di- to tri-morphic, lower ventricose, pale green to whitish with abundant purple blotches, wings narrow below expanded and ciliate upward, mouth ovate oblique; peristome cylindrical anteriorly, expanded postero-laterally, inner edge pectinate, lid 3—4.5 cm. orbicular-cordate, without glabrous, within bearing few to many long rigid unicellular hairs and circular nectar glands; pitcher within over upper third to half smooth glaucous-purple, below shining glandular; median pitchers cylindrical; upper pitchers infundibuliform gradually narrowed into tendril, pale green with purple flecks and spots, wings narrow or reduced to prominent ribs, pitcher within smooth purple over triangular posterior upper area, glandular below. *Inflorescence* 15—25 cm.; raceme with biflorous hirsute pedicels each bracteolate at fork. *Sepals* 4, subovate, ferrugineo-pubescent without and with many minute glands within. *Staminal column* equal to sepals, puberulous below, anthers 6. *Ovary* ovate, shortly stalked, pubescent. *Capsule* 18—20 mm. long, shining, valves lanceolate with depressed bilobed stigma. *Seeds* 10—12 mm. long. Macfar. in Engl. Pfl.-reich IV iii. 77.

PERAK: *Scortechini*!; on Gunong Bubu, *Wray* 3849!; at 5000

ft. elev., *King's Collector* 7395!, at 5300 ft., 7421!; at Gunong Batu Putih, *Wray* 339!, at 6700 ft. *Wray* 1643!.—DISTRIB. Malaya.

7. *NEPENTHES REINWARDTIANA*, Miq. Pl. Jungh. I. 168 (1851). A graceful branched climbing shrub. *Stem* 2—3 m. high, triangular to subcylindric. *Leaves* 7—25 cm. long, 1—3.5 cm. broad, sessile, broadly amplexicaul,  $\pm$  decurrent, herbaceous, linear lanceolate, glabrous; longitudinal veins mostly 2, rarely 3 or 4 pairs, innermost starting from near middle of rib, transverse nerves obscure reticulate; tendrils 15—30 cm. long, delicate but thickening upward; pitchers 10—20 cm. long, 2—4 cm. broad, nearly uniform, cylindric or slightly ventricose below, expanded toward mouth, glabrous, semi-membranous, pale green to purple green, wings in lower pitchers expanded non-ciliate, in upper reduced to ridges; peristome ovate, oblique, cylindric, uniform, faintly striate, lid elliptic- or orbicular-cordate, glabrous with many minute glands within, pitcher internally glaucous-violet over upper half or two-thirds, with two brown "eyes" on upper posterior triangular area, below shining glandular. *Staminal inflorescence* 20—45 cm., pistillate 10—15 cm. long; raceme lax, pedicels biflorous below uniflorous above. *Sepals* elliptic, glabrous, glandular along middle within. *Staminal column* longer than sepals, ferrugineo-tomentose below, anthers 8. *Ovary* densely tomentose. *Capsule* 25—30 mm. long, tetragonous, shining. *Seeds* 15—17 mm. long, testa around embryo brown, wings pale. Miq. Fl. Ind. Bat. I. i. 1075, Suppl. 151, 366 and Ill. Fl. Archip. Ind. 4 t. 4; Hook. f. in Trans. Linn. Soc. XXII 422 as *N. Reinwardtii*, in DC. Prodr. XVII 103 and Fl. Br. Ind. V. 70; Macfar. in Engl. Pfl.-reich IV. iii. 50.

PAHANG: *Hullett* 5716! SINGAPORE: *Wallich* not 2244 = *N. gracilis*, but "prope Kuttalam lecta ab amicis Michel"!—DISTRIB. Malaya, Sumatra, Banka, Borneo, Singga, 100—200 ft. *Hullett* (*Ridley* 5693!).

8. *NEPENTHES GRACILIS*, Korth. Verh. Nat. Gesch. Bot. 22. t. 1 (1839). Much branched, delicate, low, climbing shrubs. *Stem* 2-3 m. high, greenish purple, trigonous, glabrous. *Leaves* 10—20 cm. long, 1.5—4 cm. broad, sessile, broadly amplexicaul, decurrent, linear to elliptic, herbaceous, glabrous or slightly pubescent; longitudinal veins 5-7 pairs, united by irregular ascending nerves; tendrils 6—10 cm. long delicate; pitchers 6—12 cm. long, 1—3 cm. broad, subdimorphic, lower cylindric-ventricose with  $\pm$  expanded ciliate wings, upper cylindric with narrow wings or non-ciliate ridges, pale green

with fine purple spots or coloring without and within; peristome narrow, cylindric, uniform, striate; lid 1—2.5 cm., orbicular-cordate, glabrous, glandular within; pitcher over upper half within glaucous green to purple, below shining glandular, upper row of glands large. *Inflorescence* 10—40 cm. long, slender; pedicels 1- rarely 2-flowered. *Sepals* elliptic, tomentose without. *Staminal column* shorter than sepals, glabrous; anthers 12—8, convolute. *Ovary* ovate, ferrugineo-tomentose. *Capsule* 2—3 cm. long, often curved, brown, shining. *Seeds* 15 mm. long. Spach Hist Nat. des Veg. XIII 325, t. 144; Miq. Fl. Ind. Bat. I. 1071; Hook. f. in DC. Prod. XVII 104 and in Fl. Br. Ind. V. 71; Beccari Malesia III. 14; G. Beck in Wien. Ill. Gart. Zeit. (1895) 190; Macfar. in Engl. Pfl.-reich IV. iii. 58. *N. laevis*, Lindl. in Gard. Chron. (1848) 655. *N. Korthalsiana* Miq. l.c. 1071, Suppl. 151, 366, and Ill. Fl. Arch. Ind. (1871) 2 t. 1.

PENANG: at Batu Ferengy, *Curtis*!. PERAK: at Larut, *King's Collector* 1941!, 4019!, 4025!, 4084! at 100 ft. alt. DINDINGS: at Pulau Sembilan, *Curtis*!. MALACCA: *Jack*!; *Wallich* 2248!; *Cuming* 2310!; at Ayer Panas, *Derry*!; at Bukit Bruang, *Curtis*!. JOHOR: ? *Ridley* 11026!. SINGAPORE: *T. Anderson* 1671; at Changi, *Ridley*!. at Bukit Timah, *Ridley* (Engl. 3911)!.

*N. gracilis* var. *arenaria*, *Ridley* in Hbb. Kew and Calcutta N. 1473 is a dwarf pale form, that grew in wet sandy spots at Pramau in Pahang.

9. *NEPENTHES RAFFLESIANA*, *Jack* in Comp. Bot. Mag. I. 270 (1835). A tall rarely dwarf climbing shrub. *Stem* 15 m. or less, cylindric, branched, white tomentose when young, at length glabrous. *Leaves* 20—50 cm. long, 5—10 cm. broad, subcoriaceous, petiolate, petiole 5—15 cm. long, winged, semiamplexicaul; blade oblong to elliptic, densely white tomentose when young, later glabrous; longitudinal veins usually 5 pairs, inconspicuous; lateral nerves obscure obliquely ascending, parallel; tendril 20—40 cm. long, thickened toward pitcher; pitchers 10—20 cm. long, 7—12 cm. broad, dimorphic, lower ventricose, pale green or whitish green, richly purple spotted wings widely expanded below narrowed upward, ciliate; peristome ovate, oblique, elevated posteriorly into a high neck with dentate inner edge that carries lid, purple and green striped; upper pitchers 12—30 cm. long, 4—10 cm. broad, infundibuliform, pale green, purple striate or spotted; wings narrow, shortly or not ciliate, or reduced to strong ridges; lid 4—10 cm. long, 3—8 cm. broad, ovate-oblong, without glabrous, within with 2 parallel patches of



glands between margin and middle; spur 10—30 mm. long tapered; pitcher within from mouth to upper third or fourth of length glaucous or glauco-purple, smooth, shining and richly glandular below. *Inflorescence* 15—30 cm. long, white tomentose, later subglabrous; raceme densely flowered; pedicels uni- rarely bi-florous. *Sepals* 4, ovate or elliptic, tomentose without, crimson and densely glandular within. *Staminal column* equal to sepals, glabrous, purple; anthers 20—16 irregularly biseriate. *Ovary* oblong. white-tomentose; stigma four-lobed. peltate. *Capsule* 2—4 cm. long, sparingly tomentose. *Seeds* 15—20 mm. long, testa round, embryo brown, wings white. Korthals Verh. Nat. Ges. Bot. 35 (1839); Hook. in Bot. Mag. t. 4285 (1847); Lemaire in Fl. d. Serr. III t. 213, 214 (1847); Blume Mus. Bot. Lugd.-Bat. II. 9 (1852); Miq. Fl. Ind. Bat. 1. i. 1070 (1855); Van Houtte in Fl. d. Serr. XVI. 167 (1867); Hook. f. in DC. Prodr. XVII 96 (1873); Masters in Gard. Chron. II (1882) 424 tt. 69, 70; Hook. f. Fl. Br. Ind. V. 69 (1890); Macfar. in Engl. Pfl.-reich IV. iii. 61. *N. Sanderiana*, Burbidge Flora and Sylva II. 113 (1904), III 280 (1905) with col. pl.

MALACCA: on Mount Ophir, *Maingay* K.D. 2751!. SINGAPORE: *Jack*; *Wallich* 2242!; *Beccari*!; *T. Anderson* 162!; at Bukit Mandi, *Ridley*!; at Tampinis, *Goodenough* 4692!; at Kranji, *Ridley*, 3371!; at Changi, *Ridley* 4693!; Chanchu Kang, *King's Collector* 5629! at 300 ft. alt.—DISTRIB. Malaya, Sumatra, Borneo, Banka.

10. NEPENTHES PHYLLAMPHORA, Willd. Sp. Pl. IV. p. 2, 874 (1805). A branched, climbing or prostrate. bright green shrub. *Stem* 5—8 m. long, cylindric, sparingly stellate-pubescent when young at length glabrous, lower internodes short, upper elongate to 7 cm. *Leaves* 15—45 cm. long, 6—8 cm. broad: thin, herbaceous, petio- late; petiole 4—15 cm. long, with vertical wings, half-amplexicaul at base gradually expanded upward into the lamina; lamina elliptic-oblong, above and below glabrous or sparsely puberulous along lower rib surface, margins dentate-ciliate; longitudinal veins 6—10, commonly 7 or 8, united by many oblique parallel nerves; tendril 15—25 cm. long, thickened upwards toward pitcher; pitchers 8—15 cm. long, 2—3 cm. broad, monomorphic, subcylindric, slightly ventricose in lower half, contracted toward mouth above, pale green to reddish-green, slightly puberulous, wings narrow, ciliate or not in lower, reduced to ridges in upper pitchers; peristome cylindric, orifice circular to elliptic, transverse or slightly oblique, nearly uniform, pale green to purple; lid 2—4 cm. nearly orbicular with circular scattered

glands within; inner pitcher surface glaucous- or reddish-green over upper half, shining and with many distinct circular glands over lower half. *Inflorescence* 20—35 cm. long; peduncle and raceme stellate pubescent; pedicels 2—1-flowered below, 1-flowered above. *Sepals* 4, elliptic tomentose without, abundantly glandular within. *Staminal column* glabrous, anthers 20—16, biseriate, convolute. *Ovary* ovate, white-tomentose, style short with 4-grooved stigmas. *Capsule* 18—20 mm. long. *Seeds* 15—16 mm. long, delicate. Jack in *Comp. Bot. Mag.* I. 271; Korthals *Verh. Nat. Gesch. Bot.* (1839) 28; Blume *Mus. Bot. Lugd.-Bat.* II. 7; Miq. *Fl. Ind. Bat.* I. i, 1069; Hook. f. in *Trans. Linn. Soc.* XXII 422, in *DC. Prod.* XVII 97, and *Fl. Br. Ind.* V. 69; Beccari *Malesia* I. 213 and III. 11; Hemsley in *Bot. Mag.* t. 8067; Macfar. in *Engl. Pfl.-reich* IV. iii. 63. *Phyllamphora mirabilis*, Lour. *Fl. Cochinch.* 606. *N. macrostachya*, Blume and *N. fimbriata*, Blume *Mus. Bot. Lugd.-Bat.* II. 7; Miq. *Ill. Fl. Archip.* Ind. 3 t. 2, 5 t. 6. *N. distillatoria*, Wall. *Cat.* 2244; Aiton *Hort. Kew.* ed. 2, V. 420. *N. O'Brieniana*, Rodigas in *Ill. Hort.* (1890) 109.

KEDAH, at Langkawi Island, *Mahomed Hanif!*. PENANG: on Mount Elvira, *Curtis!*, at Waterfall, *Curtis!*. PROV. WELLESLEY: at Tassek Glugor, *Curtis!*. PERAK: at Ulu Bubong, *King's Collector* 10631! at 400—600 ft. alt.; at Telok Bahang, *Curtis!*. SINGAPORE: *Wallich* 2244!; at Changi, *Ridley.*—DISTRIB. China and Cochinchina, Malaya, Sumatra, Borneo and N. Guinea?, N. Australia.

### Family XCVIII. PIPERACEAE.

By C. DE CANDOLLE.

Herbs or shrubs or small trees, growing on the soil or epiphytic, parenchyma with aromatic or resiniferous cells. Stem and branches containing either (in *Peperomia*) a system of distinct fibrovascular bundles with limited centrifugal growth, disposed in more or less concentric rows and anastomosing together in the nodes; or (in *Piper*) two fibrovascular systems, one of which is composed of peripheric bundles with unlimited centrifugal growth, the other of intramedullar bundles with limited centrifugal growth; the bundles of both systems anastomosing together in the nodes. *Leaves* simple, entire, exstipulate in *Peperomia*, stipulate in *Piper*. *Inflorescence* spiciform. *Flowers* very small, 1—2-sexual. *Perianth* 0. *Stamens* 1—10, hypogynous or connate with the ovary at its extreme base, rarely higher. *Ovary* 1-celled, a single terminal orthotropous ovule.

*Fruit* (a berry) indehiscent. *Seed* adherent to the endocarp; embryo-sac persistent at the apex of a copious perisperm, including the dicotyledonous embryo and a scanty endosperm; radicle superior.

Stigma globular or rarely bilobed, very small; fruit minute,  
 0.5—2 mm. long. Leaves exstipulate .. .. 1. PEPEROMIA.  
 Stigmas 2—6, very rarely a single globular stigma (so far  
 only in two species); fruit small, 3—11 mm. long.  
 Leaves stipulate .. .. 2. PIPER.

1. PEPEROMIA, Ruiz and Pavon.

Herbs, annual or perennial, usually succulent. *Leaves* exstipulate, alternate or (seemingly) opposite or verticillate. *Spikes* pedunculate, either solitary and inserted in the axils of fully developed leaves, or terminal, or inserted in the axils of imperfect leaves and then geminate or paniculate or umbellate, or very rarely epiphyllous. *Bract* very small, usually hypopeltate, seldom squamiform. *Flower* bisexual, sessile or subsessile, often sunk with its bract in a depression of the rachis. very rarely (only in two West Indian species) connate with its bract. *Stamens* 2, lateral, hypogynous; anthers extrorse, 2-celled, bivalvate when opening. *Ovary* free, formed by a single carpel; stigma globular or rarely bilobed, always very small and sometimes hardly visible; ovule with a single integument. *Berry* usually rounded at its base or more rarely contracted into a slender stipe.

- 1°. Leaves opposite or the upper ones ternate-quaternate.  
 a. Stem and leaves more or less pubescent.  
 Stigma inserted obliquely a little below the summit of the ovary; limb of leaf elliptic or obovate-elliptic, cuneate at the base, up to 4 mm. long .. 1. *P. dindigulensis*  
 Stigma terminal; limb of leaf obovate or rounded-obovate, acute or subacute at the base, 12.5—20 mm. long .. .. 2. *P. Wrayi*.  
 b. Stem and leaves glabrous.  
 Stigma terminal; limb obovate or elliptic-rhomboid, rounded at the apex, acute at the base, 26—40 mm. long .. .. 3. *P. portulacoides*.  
 2°. Leaves alternate.  
 a. Limb glabrous on both surfaces.  
 Stigma inserted obliquely a little below the summit of the ovary. Limb elliptic, cuneate at the base, obtuse at the apex, up to 40 mm. long.. .. 4. *P. Maxwelliana*.  
 Stigma terminal.  
 Berry globose, uniformly glandulose-asperulate. Limb rounded-ovate, cordate at the base, obtuse at the apex, up to 29 mm. long, and 31 mm. wide .. 5. *P. malaccensis*.

- Berry covered with longitudinal glandulose-asperulate riblets. Limb deltoid-cordate, subobtusely acuminate at the top, up to 26 mm. long and 19 mm. wide 6. *P. pellucida*.
- b. Limb densely hirtellous on both surfaces.  
Stigma inserted obliquely a little below the summit of the ovary. Limb rounded-obovate, 23 mm. long, 14.5 mm. wide .. .. . 7. *P. kotana*.

1. *PEPEROMIA DINDIGULENSIS*, Miq. Syst. Pip. 122, in Hook. Journ. Bot. V. 549 and Ill. Pip. 19, t. 13. Erect, stem and branches puberulous. *Leaves* opposite or the terminal ternate, moderately long-petioled; limb membranous when dry, elliptic or obovate-elliptic, cuneate at the base, obtuse or subobtusate at the top, puberulous on both surfaces, 5-nerved; up to 45 mm. long and 38 mm. wide; petiole puberulous, about 8 mm. long. *Peduncles* axillary and terminal, about 8 mm. long, puberulous. *Spikes* 7—8 cm. long, filiform, glabrous; limb of bract rounded, subsessile at its centre; anthers elliptic; ovary emergent, obovate; stigma globular, glabrous, obliquely inserted slightly lower than the apex of the ovary. C. DC. in Prodr. XVI. i. 442; Wight Ic. t. 1921; Hook. f. Fl. Br. Ind. V. 98 exclud. syn. *P. Thwaitesii*, C. DC. *P. Heyneana*, Wight Ic. t. 1922. *Piper ovalifolium*, Heyne in Wall. Cat. n. 6663 A. and B. (except lower specimen, *vide* Hook. f. l. c.).

PAHANG: top of the Kota Glanggi caves, *Ridley* 2346. SELANGOR: rocks at Batu caves, *Ridley*.—DISTRIB. India (Deccan Peninsula, rocks of Dindigul).

2. *PEPEROMIA WRAYI*, C. DC. in Records Bot. Survey Ind. VI. 1. (191<sup>2</sup>). Stem decumbent, puberulous, rooting at the nodes; branches erect, densely puberulous, nearly 1 mm. thick, angulose when dry, ramulose, up to 10.5 cm. long. *Leaves* opposite, petioled; limb puberulous at the margins on the upper surface, otherwise glabrous, obovate or the uppermost rounded-obovate, acute or subacute at the base, the lower up to 20 mm. long and 7—15 mm. wide, the uppermost 6 mm. in diam.; petiole densely puberulous, 4—6 mm. long. *Peduncles* terminal, glabrous, up to 12.5 mm. long. *Spikes* about 24 mm. long and 1 mm. thick, glabrous; limb of bract rounded with short central pedicel; anthers elliptic, filaments very short; ovary ovate, stigma terminal, glabrous. *Berry* globose, asperulate, nearly 1 mm. in diam., its base immersed in the rhachis.

PERAK: upper part of the valley of the Batang Padang, at 1500—2000 ft. altitude, on dead tree, *Wray* 1455.

3. *PEPEROMIA PORTULACOIDES*, A. Dietr. Sp. Pl. Ed. VI. I. 172 (1831). Herb: succulent, quite glabrous; branches erect from a creeping stem, up to 6 mm. thick, flattened when dry. *Leaves* opposite or the upper ones ternate-quaternate, petioled; limb membranous when dry, pellucid-dotted, obovate or elliptic-rhomboid, acute at the base, rounded at the top, 3-nerved; 26—40 mm. long and up to 26 mm. wide; petiole 5—12 mm. long. *Peduncles* axillary and terminal, 3—4 cm. long. *Spikes* up to 5 cm. long, filiform when dry; limb of bract round with a very short central pedicel; anthers subglobose; ovary turbinate, emergent; stigma terminal, punctiform, puberulous. Miq. Syst. Pip. 130 and in Hook. Lond. Journ. Bot. V. 550; C. DC. in Prodr. XVI. i. 443; Wight Ic. t. 1922; Hook. f. Fl. Br. Ind. V. 98. *P. Candolleana*, Miq. Syst. Pip. 130. *Piper portulacoides*, Lam. Ill. 82; Vahl. Enum. I. 350. *P. Trifolium* Herb. Willd. n. 737.

SELANGOR: rocks at Batu caves, *Ridley*.—DISTRIB. India (Travancore mountains, Courtallum), Bourbon, Mauritius.

4. *PEPEROMIA MAXWELLANA*, C. DC. in Records Bot. Surv. Ind. VI. 1. (1912). Stem decumbent, rooting at the nodes; spiciferous branches erect, glabrous, nearly 1 mm. thick when dry. *Leaves* alternate, moderately long petioled; limb subcoriaceous and fuscous when dry, elliptic, obtuse at the top, cuneate at the base, 3-nerved, glabrous on both surfaces and very minutely ciliate at the margins near the summit, up to 40 mm. long and 20 mm. wide; petiole glabrous, 5 mm. long. *Peduncles* terminal and axillary, glabrous, 8—10.5 mm. long. *Spikes* glabrous, up to 5 cm. long, little less than 1 mm. thick, densiflorous; limb of bract orbicular, 0.5 mm. in diam., subsessile at its centre; ovary emergent, obovate; stigma glabrous, obliquely inserted slightly lower than the top of the ovary; bract and ovary reddish-punctulate when dry.

PERAK: Maxwell's hill, *Ridley* 5481.

5. *PEPEROMIA MALACCENSIS*, *Ridley* in Kew Bull. (1895) 185, *ex* C. DC. in Records Bot. Surv. Ind. VI. 2. Stems prostrate, succulent, glabrous, subangulose, rooting from the nodes, little more than 1 mm. thick when dry. *Leaves* alternate, moderately long petioled, glabrous; limb dark green or cupreo-fuscous when living, fuscous and membranous when dry, rounded-ovate, the base not deeply cordate, the summit obtuse, 5-nerved, 29 mm. long and up to 31 mm. wide; petiole 12.5 mm. long. *Peduncles* terminal, nearly as long as the petiole, glabrous. *Spikes* 38 mm. long when flowering, glabrous;

limb of bract oblong-rounded with a central pedicel immersed with the flower in the rhachis; ovary globose, stigma terminal, minute, glabrous. *Berry* globose, asperulate, its base immersed in the rhachis, nearly 1 mm. in diam.

MALACCA: Batu Tiga, rocks in forest, *Derry* 80.

6. *PEPEROMIA PELLUCIDA*, Kth. in H. B. K. Nov. Gen. 1. 64 (1815); Kunth Syn. I. 117; Pl. Aeq. II. 53. Annual, erect, quite glabrous, about 30 cm. high, ramulose; branches pellucid when dry. *Leaves* alternate, petioled; limb membranous and pellucid when dry, deltoid-cordate, subobtusely acuminate, 7-nerved, up to 26 mm. long and 19 mm. wide; petiole 14.5 mm. long. *Peduncle* terminal, leaf-opposed, nearly as long as the petiole. *Spike* about twice as long as the leaf, filiform membranous when dry, glabrous; limb of bract round, subsessile at its centre; anthers rounded, filaments very short. *Berry* globose, mucronate at the apex, with longitudinal verruculose ribs; stigma terminal, puberulous. A. Dietr. Sp. Pl. Ed. VI. 1. 164; Miq. Syst. Pip. 79 and in Hook Lond. Journ. Bot. IV. 413; C. DC. in Prodr. XVI. i. 402; Dahlst. Stud. S. and C. Amerik. Peper. 16, t. 1, fig. 1. *Piper pellucidum*, L. Sp. I. 163; J. Hill Veg. Syst. XXVI. t. 18, fig. 3; Aublet Hist. Pl. Guy. I. 21; Lam. Ill. 82; Vahl Enum. I. 346; Willd. Sp. Pl. I. 163; Spreng. Syst. Veg. 117.

Naturalized. PENANG: Common in the town, *Curtis* 1968. PERAK: *Wray* 1769. TRINGGANU, Bundi, *Rostado*. SINGAPORE: Deschamps; shady places, *Kunstler* 211.—DISTRIB. Trop. America, West Indies, Trop. Africa, Malayan Archipelago, India (Poona, *Cooke*; Andamans *King's Coll.* 11891).

7. *PEPEROMIA KOTANA*, C. DC. in Records Bot. Surv. Ind. VI. 2 (1912). Stem erect from a creeping base, densely hirtillous, about 1 mm. thick when dry. *Leaves* alternate, petioled; limb densely hirtillous, on both surfaces, rounded-obovate, 23 mm. diam. in the inferior leaves; elliptic, subacute at the base, rounded at the top, 23 mm. long, 14.5 mm. wide, 5-nerved in the superior leaves; petiole densely hirtillous, 10 mm. long in the inferior, 4 mm. long in the superior leaves. *Peduncle* terminal. *Spike* 27 mm. long, 1 mm. thick, glabrous, densiflorous; limb of the bract obovate, subsessile at its centre, brown-dotted when dry; anthers rounded; ovary emergent, obovate; stigma punctiform, glabrous, inserted obliquely and slightly lower than the top of the ovary.

PAHANG: Kota Glanggi, *Ridley*.

This species is very much like *P. convexa*, Miq., from which it differs by its obovate bract.

2. PIPER, L. (*pro parte*).

Shrubs or small trees, with swollen nodes. *Leaves* provided with stipules inserted on the margins of the petiolar sheath. *Spikes* pedunculate, usually oppositifolious, rarely axillary or condensed at the top of an axillary ramulet. *Flowers* unisexual or bisexual, sessile or rarely pedicellate. *Stamens* 2—6, rarely 1 or 8—10, hypogynous or connate with the ovary at its base, rarely higher; anthers deciduous, usually 4-valvate, rarely 2-valvate when opening, slits lateral, filaments persistent. *Ovary* free or partly imbedded in and connate with the rhachis; stigmas 2—6, very rarely a single terminal stigma.

*Key to the Sections.*

- A. Flowers sessile.
  - a. Spikes oppositifolious.
    - Bracts not connate .. .. SECTION I, EUPIPER.
    - Bracts connate at their lower and upper ends .. .. SECTION II, MULDERA.
  - b. Spikes condensed at the top of an axillary ramulet .. .. SECTION III, HECKERIA.
- B. Flowers pedicellate .. .. SECTION IV, ENCKEA.

SECT. I.—EUIPIPER C. DC. in *Prodr.* XVI. 1. 339, *emend.*

*Spikes* oppositifolious. *Bracts* not connate, hypopeltate, with a central pedicel or subsessile or adnate to the rhachis and then free only at their ends and lateral margins. *Flowers* sessile, unisexual or rarely bisexual. *Stamens* 2, lateral, rarely 3—4 of which 2 are lateral. *Ovary* free or partly imbedded in and concrescent with the rhachis.

*Key to the species of the Malayan Peninsula.*

(All dioecious, except ns. : 7, 25, 32, 46, 48 which are polygamous.)

*N.B.*—All measurements and other foliar characters indicated in this key and in the diagnoses always refer to the leaves of the upper part, that is to say of the flowering part of branches. The width of leaves is taken from their widest portions.

- A. Berry not stipitate. (Nos. 1—29).
  - 1°. Bract not adnate to the rhachis, rounded or obovate, with central pedicel or sessile. (Nos. 1—'3).
    - a. A single orbicular or globose stigma, berry partly imbedded in the rhachis. (Nos. ! 2).
  - Δ Leaf entirely glabrous. Limb oblong-elliptic-lanceolate, 9.5—11.5 cm. long, 2—3 cm. wide .. 1. *P. globulistigma*

- △△ Leaf more or less pubescent, hairs ramulose. Limb oblong-elliptic-lanceolate, up to 12 cm. long, and 5 cm. wide .. .. . 2. *P. ramispilum*.
- b. Stigmas 3-4-5. (Nos. 3-23).
- △ Ovary and berry prolonged upwards into a style. (Nos. 3-7).
- × Limb multinerved.<sup>1</sup> Berry partly imbedded in the rachis.  
 Leaf entirely glabrous. Limb elliptic-lanceolate, 8.5-9.5 cm. long, 3.2-3.5 cm. wide.. .. 3. *P. rufispicum*.
- ×× Limb multiplined.<sup>2</sup> Ovary and berry free.  
 - Leaf entirely glabrous.  
 + Bract orbicular; spike much shorter than the leaf. Limb oblong-elliptic-lanceolate, 11-13 cm. long, 3-4 cm. wide .. .. . 4. *P. penangense*.
- ++ Bract obovate; spike nearly as long or longer than the leaf.  
 Limb elliptic-lanceolate, 12-13.5 cm. long, 5-5.7 cm. wide .. .. . 5. *P. conibaccum*.  
 Limb elliptic-lanceolate, 15-22 cm. long, 6-10.5 cm. wide .. .. . 6. *P. magnibaccum*.
- Leaf glabrous above, pubescent underneath, young branches retrorsely hirsute.  
 Limb elliptic, 11-15 cm. long, 5.5-7 cm. wide .. .. 7. *P. stylosum*.
- △△ Ovary and berry without styles. (Nos. 8-23).
- Ovary and berry free. (Nos. 8-18).
- × Limb multinerved. (Nos. 8, 9).
- Leaf entirely glabrous. Limb oblong-ovate, acutely acuminate, the base rounded on one side, attenuate on the other side .. .. . 8. *P. flavibaccum*.
- Leaf hirsute on the petiole and base of the limb. Limb oblong-ovate, acutely acuminate, the extreme base half-cordulate.. .. . 9. *P. minutum*.
- ×× Limb multiplined. (Nos. 10-7).
- Leaf entirely glabrous. (Nos. 10-5).
- + Base of the limb rounded on both sides or at least on one side.
- Base of the limb equilateral or nearly so. Limb ovate, acutely acuminate, 11.5 cm. long, nearly 5 cm. wide .. .. . 10. *P. semangkoanum*.
- Base of the limb distinctly inequilateral .. .. 11. *P. gymnocladum*.  
 Limb oblong-elliptic, acutely acuminate, up to 18.8 cm. long .. .. . 12. *P. boehmeriae-folium* (forma).

<sup>1</sup> That is to say with all the main nerves free from the base.

<sup>2</sup> That is to say with some of the main nerves issuing from the central nerve, the others free from the base.



- ++ Base of the limb attenuate on both sides.
- Spiciferous branches glabrous  
 Limb 7.6 cm. long, ovate-lanceolate. Peduncle  
 much longer than the petiole .. .. 13. *P. lonchites*.
- Limb 16 cm. long, elliptic-lanceolate. Bract rounded 14. *P. gymnophyllum*.
- Limb 15—22 cm. long, elliptic-lanceolate. Bract  
 obovate .. .. 6. *P. magnibaccum*.
- Spiciferous branches puberulous. Limb up to  
 8.5 cm. long, ovate-lanceolate .. .. 15. *P. puberuli*.  
*rameum*.
- Limb glabrous above, pubescent underneath. (Nos.  
 16, 17).
- + Base of limb cordate and equilateral. Limb up to  
 22 cm. long, rounded ovate, acutely acuminate .. 16. *P. velutinervium*.
- ++ Base of limb rounded on both sides and equilateral.  
 Limb about 9 cm. long, ovate, acutely acuminate .. 17. *P. sarmentosum*.
- +++ Base of limb rounded on one side, attenuate on  
 the other. Limb up to 12 cm. long, oblong-  
 elliptic-lanceolate .. .. 12. *P. boehmeriae*-  
*folium, var. lanatum*.
- xxx Limb penninerved,<sup>1</sup> entirely glabrous, attenuate  
 at the base.  
 Limb oblong-elliptic-lanceolate, 12—15 cm. long .. 18. *P. Scortechinii*.
- Ovary and berry partly imbedded in the rhachis.  
 (Nos. 19—23).
- × Limb multinerved, glabrous above puberulous  
 underneath on the nerves. Base of limb cordate  
 and equilateral. Limb oblong-ovate acutely  
 acuminate .. .. 19. *P. longum*.
- ×× Limb multiplinnerved.
- Limb entirely glabrous.
- + Berry glabrous.  
 Limb ovate or rounded-ovate, subacutely acuminate,  
 up to 5.2 cm. long .. .. 20. *P. subfragile*.
- Limb ovate, acutely acuminate, 13.5 cm. long,  
 7 cm wide .. .. 21. *P. minutistigmum*.
- ++ Berry tomentose. Limb ovate or rounded-ovate,  
 acutely acuminate, 10—13 cm. long .. .. 22. *P. Belle*.
- Limb glabrous above, pubescent underneath, amply  
 ovate, acutely acuminate, up to 22.5 cm. long,  
 the base cordate and inequilateral .. .. 23. *P. febrifugum*.
- 2°. Bract adnate to the rhachis, obovate-oblong or  
 elliptic-oblong or oblong. (Nos. 24—29).
- α. Bract free at both ends and along its lateral and  
 thinned margins. (Nos. 24—28).

<sup>1</sup> That is to say with all its main lateral nerves issuing from the central nerve.

- Limb entirely glabrous, multiplined, the base attenuate on both sides. (Nos. 24—27).
- + Bract quite glabrous. (Nos. 24—26).  
Limb elliptic, acutely acuminate, nearly 10·5 cm. long, red underneath .. .. . 24. *P. porphyrophyllum*.
- Limb elliptic-lanceolate, acutely and rather long acuminate, 11—15 cm. long, 5—9 cm. wide.  
Anthers rounded .. .. . 25. *P. nigrum*.
- Limb elliptic-lanceolate, acutely and rather long acuminate, 13—15 cm. long and 4·5—5·5 cm. wide. Anthers ovate .. .. . 26. *P. flavispicum*.
- ++ Bract minutely puberulous on the back and ciliate.  
Limb elliptic-lanceolate, acutely acuminate, 7·5—10 cm. long .. .. . 27. *P. longicaule*.
- Limb glabrous above, puberulous underneath, penninerved.  
Limb elliptic, acutely acuminate, 12 cm. long, the base rounded on one side. . . . . 28. *P. kotanum*.
- b. Bract free at both ends, its lateral margins not thinned.  
Limb elliptic, acutely acuminate, about 10·5 cm. long, 4·5—6·5 cm. wide, the base rounded on both sides .. .. . 29. *P. leptoneuma*.
- B Berry stipitate. Nos. 30—48).
- 1°. Bract rounded. (Nos. 30—32).
- × Limb multiplined.
- Limb entirely glabrous, 10—13 cm. long. Bract glabrous.  
Limb ovate, acutely acuminate, cordate at the base 30. *P. dindingsanum*.  
Limb lanceolate .. .. . 31. *P. caninum* var. *glabrum*.
- Limb glabrous above, pubescent underneath, 9—11·5 cm. long. Bract pubescent.  
Limb ovate-oblong, acutely acuminate, attenuate at the base .. .. . 31. *P. caninum*.
- × × Limb penninerved, pubescent on both surfaces, elliptic-lanceolate, up to 17·5 cm. long .. 32. *P. malaccense*.
- 2°. Bract obovate or oblong-elliptic. (Nos. 33—48).  
× Limb multinerved, entirely glabrous.  
Limb oblong-ovate, subobtusely acuminate, up to 9 cm. long .. .. . 33. *P. selangorensis*.
- × × Limb multiplined. (Nos. 34—42).
- Limb entirely glabrous. (Nos. 34—41).
- Bract not adnate to the rhachis, with a central pedicel or sessile. (Nos. 34—37).
- Base of limb rounded on one side, attenuate on the other side.  
Limb oblong-ovate acutely acuminate, up to 12·5 cm. long .. .. . 34. *P. subalbicans*.

- Base of limb attenuate on both sides and equilateral.  
 + Limb 5-plinerved.  
 Limb subovate-elliptic-lanceolate, subacutely acuminate, 9—11·5 cm. long .. .. 35. *P. Curtisii*.  
 Limb oblong-elliptic, acutely acuminate, up to 10·5 cm. long .. .. 36. *P. paucistigmum*.
- ++ Limb 7-plinerved, elliptic-lanceolate, acutely acuminate, up to 7·5 cm. long .. .. 37. *P. Maxwellianum*.
- Bract adnate to the rhachis and free only at the margin. (Nos. 38—42).
- Base of limb cordate or cordulate, or obtuse.  
 Limb ovate, subobtusely acuminate, 9 cm. long, 33—44 mm. wide .. .. 38. *P. pedicellosum*.  
 Limb oblong-ovate or subobovate-oblong, acutely attenuate, about 25 cm. long, 11 cm. wide .. 39. *P. ribesioides*.  
 Limb oblong-elliptic, acutely and rather long acuminate, about 10·5 cm. long, 42 mm. wide .. 40. *P. mucronatum*.
- Base of limb attenuate and equilateral.  
 — Limb glabrous on both sides.  
 Limb elliptic-lanceolate, acutely acuminate, 11·5 cm. long, 6 cm. wide .. .. 41. *P. longibracteum*.
- Limb glabrous above, pubescent underneath.  
 Limb elliptic-lanceolate, acutely acuminate, up to 14·5 cm. long, 6 cm. wide .. .. 42. *P. xanthocarpum*.
- × × × Limb penninerved. Bract obovate or oblong. (Nos. 43—48).
- Limb entirely glabrous. (Nos. 43, 44).
- Base of limb rounded on one side, attenuate on the other side.  
 Limb oblong-elliptic, acutely acuminate, 13—16 cm. long, 4·8—7 cm. wide .. .. 43. *P. larutanum*.
- Base of limb attenuate on both sides.  
 Limb elliptic-lanceolate, acutely acuminate, 13-16 cm. long, 4·8—7 cm. wide .. .. 44. *P. collinum*.
- Limb pubescent on both surfaces. Bract shortly pedicellate. (Nos. 45—48).
- Base of limb cordate or cordulate.  
 Limb oblong-elliptic, shortly and subacutely acuminate, up to 17 cm. long and 7 cm. wide .. 45. *P. muricatum*  
*forma peninsularis*.
- Limb oblong acutely acuminate, 20·8—33·8 cm. long, 4·2—5·6 cm. wide .. .. 46. *P. protractum*.
- Base of limb rounded and slightly inequilateral.  
 Limb subobovate-elliptic, acutely acuminate, stipe hirtellous .. .. 45. *P. muricatum*,  
*forma pilistipes*.
- Base of limb rounded on one side, attenuate on the other side.

- Limb obovate-oblong, acutely acuminate, 20 cm.  
long, up to 7 cm. wide .. .. . 47. *P. bipedale*.
- Base of limb attenuate on both sides and equilateral.  
Limb lanceolate-elliptic, acutely acuminate, nearly  
25 cm. long, 12 cm. wide .. .. . 48. *P. Ridleyi*.
- C Ovary and berry unknown. (Nos. 49—60).
- 1° Bract not adnate to the rachis, rounded or obovate  
with a central pedicel or sessile. (Nos. 49—58).
- × Limb multiplined. (Nos. 49—57).
- Limb entirely glabrous. (Nos. 49—55).
- Base of limb rounded on both sides and slightly  
inequilateral.
- Bract glabrous.  
Limb ovate, acutely attenuate, up to 16.5 cm. long,  
9 cm. wide .. .. . 49. *P. nigrantherum*.  
Limb oblong-ovate, acutely acuminate, about 9 cm.  
long, 4 cm. wide .. .. . 50. *P. filipes*.
- Bract pubescent. Limb oblong-elliptic, shortly and  
obtusely attenuate, up to 9.5 cm. long, 3.5 cm.  
wide .. .. . 51. *P. rufibracteam*.
- Base of limb rounded on one side, attenuate on  
the other side.  
Limb elliptic-oblong, acutely and rather long  
acuminate, 12.5 cm. long, 4.5 cm. wide .. 52. *P. Kunstleri*.
- Base of limb attenuate on both sides.
- Bract rounded.  
Limb elliptic-lanceolate, equilateral at the base,  
8.5 cm. long, 2.6 cm. wide .. .. . 53. *P. curtipetiolum*.  
Limb elliptic-oblong, nearly equilateral at the base,  
up to 15 cm. long and 4 cm. wide .. .. . 54. *P. erecticaule*.
- Bract subobovate-elliptic.
- Limb elliptic-lanceolate, inequilateral at the base,  
14.5 cm. long, 4 cm. wide .. .. . 55. *P. eucalyptolum*  
*bum*.
- Limb glabrous above, pubescent underneath.  
Base of limb cordate. Limb rounded-ovate,  
obtusely acuminate, up to 15 cm. long, 14 cm.  
wide .. .. . 56. *P. subrubrispicum*.
- Limb pubescent on both surfaces.  
Base of limb attenuate on both sides and equilateral.  
Limb oblong-ovate-lanceolate, up to 10.5 cm. long,  
3.5 cm. wide .. .. . 57. *P. longamentum*.
- × × Limb penninerved, entirely glabrous. Base of limb  
attenuate on both sides.  
Limb sessile, subobovate-elliptic-oblong, acutely  
acuminate, up to 19 cm. long, 5 cm. wide .. 58. *P. subsessilim*  
*bum*.

- 2°. Bract adnate to the rhachis, oblong or obovate-oblong, free at both ends and at its lateral margin. (Nos. 59, 60).  
 Limb entirely glabrous, multiplined, the base rounded or subrounded on both sides.  
 Anthers obovate. Limb elliptic, acutely acuminate, 14 cm. long, 9 cm. wide .. .. . 59. *P. obovantherum*.  
 Anthers reniform. Limb oblong-ovate, acutely acuminate, up to 18 cm. long and 6 cm. wide .. 60. *P. argyrites*.  
 D. Inflorescence unknown. .. .. . 61. *P. clypeatum*.

1. PIPER GLOBULISTIGMUM, C. DC. in Records Bot. Surv. Ind. VI. 3 (1912). Branches glabrous, light brown when dry, the spiciferous up to 1 mm. thick; collenchyma continuous, not libriform; no peripheral lysigenous canal; many dark brown cells in bark and pith. *Leaves* shortly petioled, glabrous; limb rigid and opaque, 9.5—11.5 cm. long and 2—3 cm. wide, oblong-elliptic-lanceolate, acutely and rather long attenuate, the sides of the base unequally long, the shortest tapering, the longest rounded; penninerved, the central nerve emitting on each side 3 alternate ascendent nerves, the uppermost from 24—36 mm. above the base; petiole about 5.5 mm. long, 2 of which between the side of the limb, sheath basal. *Peduncle* glabrous, 26 mm. long. *Spike*: ♀ cylindric, 52 mm. long and 1 mm. thick when ripe; rhachis densely velutino-puberulous; bract glabrous, its limb orbicular, rigid, 1 mm. in diam. with a very short central pedicel. *Berry* partly imbedded in the rhachis, its upper free portion rounded and densely velutino-puberulous; a single stigma, globular and very small.

PERAK: *Scortechini*!

2. PIPER RAMIPILUM, C. DC. in Records Bot. Surv. Ind. VI. 3 (1912). Creeper, up to 9 m. long. Branches pubescent when young, soon glabrous, the spiciferous 2 mm. thick drying brown; hairs ramulose in the female but not so in the male; collenchyma continuous, not libriform; a single central lysigenous canal. *Leaves* shortly petioled; limb rigid-membranous when dry, subpellucid-dotted, up to 12 cm. long and 5 cm. wide, glabrous above, pubescent on the nerves underneath, the hairs ramulose; ovate elliptic, acutely acuminate, the base cordulate and slightly inequilateral; 7-plinerved, the central nerve emitting 2 ascendent alternate nerves, the uppermost from about 32 mm. above the base, and having on each side of it 2 nerves free from the base, the external more arcuate and much shorter than the others; petiole densely pubescent, 8 mm. long, of

which 2 mm. between the sides of the limb, sheath prolonged up to the middle of the petiole; stipules glabrous, confluent in an obtuse apex. *Peduncle* sparingly pubescent, 20—24 mm. long, slender. *Spike*: ♂ about 7·8 cm. long, up to 2 mm. thick, attenuate at the top; rhachis glabrous; bract glabrous, its limb rounded 1 mm. in diam; stamens 2, anthers elliptic, 2-valvate: ♀ 10·5 cm. long and a little over 2 mm. thick when ripe, obtuse at the top; rhachis and bract as in the male; ovary glabrous, its base partly imbedded in the rhachis; a single minute orbicular stigma. *Berry* free except at its extreme base, globose, about 1 mm. in diam., orange or dark-yellow when living, black when dry.

PENANG: at Balik Pulau at 800—1000 ft. alt., *Curtis* 792; *Kunsiler* 1481; *Deschamps*. PERAK: at Gunong Bulang, on trees, *King's Collector* 270; at Gunong Keledang, *Ridley* 9582; at Larut, *King's Collector* 3574; JOHORE: at Bukit Saya, *Ridley* 11022.

3. *PIPER RUFISPICUM*, C. DC. in *Records Bot. Surv. Ind.* VI. 4 (1912). Branches glabrous, light brown when dry, the spiciferous about 1 mm. thick; collenchyma in distinct laterally widened bundles, its inner zone libriform; a central and several peripheric lysigenous canals. *Leaves* glabrous; limb rigid and opacous, 8·5-9 cm. long and 3·2—3·5 cm. wide, elliptic-lanceolate, acutely attenuate, the base slightly inequilateral, attenuate on one side, sub-attenuate on the other side; 6-nerved, 3 nerves on one side and 2 on the other side of the limb. *Peduncle* glabrous, 13 mm. long. *Spike*: ♀ cylindrical, rounded at the top, 5·7 cm. long, 2·6 cm. thick; rhachis rufo-tomentose; bract suborbicular, emarginulate at the top, minutely glandulose on both surfaces, sessile at its centre, 1 mm. in diam. *Berry* deeply imbedded in the rhachis, with a free conic and slender style about 1·5 mm. long; stigmas 4, short, ovate-acute.

PERAK: at Ijuk, *Scortechini* 1177.

4. *PIPER PENANGENSE*, C. DC. in *Prod.* XVI. i. 353 (1869). Erect, about 2 ft. high. Branches glabrous, fuscous when dry; the spiciferous nearly 2 mm. thick; collenchyma in distinct, laterally much widened, bundles and not libriform; a single centrally lysigenous canal. *Leaves* glabrous, shortly petioled; limb membranous when dry, minutely pellucid-dotted, 11—13 cm. long, 3—4 cm. wide, oblong-elliptic-lanceolate, acutely acuminate, the base equilateral, acute or nearly so; 7-plinerved, the central nerve emitting 2 ascendent alternate nerves, the uppermost from about 18 mm. above its base,

and having on each side of it 2 lateral ascendent nerves free from the base; petiole 4—6 mm. long, sheath basal. *Peduncle* glabrous, about 15 mm. long. *Spike*: ♀ ovate-globose, nearly 4—6 mm. long, rhachis pilose; bract glabrous, orbicular, subsessile, 1·5 mm. in diam.; ovary free, glabrous, ovate, with an elongated style and 3—4 ovate-acuminate stigmas. *Berry* sessile, globose, about 3·5 mm. long with its slender style. Hook f. Fl. Brit. Ind. V. 88 *Chavica penanensis*, Miq. Syst. Pip. 279, Illustr. 45. t. 44.

PENANG: *Wallich* 6642 B. (in Herb. Berol), 6644 B. (in Herb. Hook.); Ulu Selama, *Wray* 4170. PERAK: at Gunung Inas, *Scortechini*; *Wray* 4087.

5. PIPER CONIBACCUM, C. DC. in Records Bot. Surv. Ind., VI. 4 (1912). Branchlets glabrous, the spiciferous 4 mm. thick, 6—7-costellate, the riblets membranous; collenchyma in distinct and laterally widened bundles, not libriform; a single central lysigenous canal, abundant yellow cells in bark and pith. *Leaves* shortly petioled, glabrous; limb firm when dry, 12—13·5 cm. long, 5—5·7 cm. wide, elliptic-lanceolate, subacutely acuminate, the base equilateral, acute; 7-plinerved, the central nerve emitting 2 ascendent nerves, the uppermost from 20—30 mm. above the base, and having on each side of it 2 ascendent nerves free from the base; petiole 10 mm. long, sheath basal. *Peduncle* as long as the petioles. *Spike*: ♀ nearly 40·3 cm. long; rhachis glabrous; bract glabrous, its limb obovate, attenuate in its lower part, 2 mm. long; ovary free, attenuate into a conic style; stigmas 3—5, more rarely 5 and sometimes 2, linear. *Berry* glaucescent when dry, its style 7 mm. long.

SELANGOR: at Semangko, *Ridley* 17056.

6. PIPER MAGNIBACCUM, C. DC. in Records Bot. Surv. Ind. VI. 5 (1912). Scandent. Branches glabrous, drying brown, the spiciferous up to 6 mm. thick and costellate; collenchyma in distinct laterally widened bundles, not libriform; a single central lysigenous canal. *Leaves* moderately long petioled, glabrous; limb subcoriaceous when dry, 15—22 cm. long, 6—10·5 cm. wide; elliptic-lanceolate, acutely acuminate, the base acute and equilateral; 7—9-plinerved, the central nerve emitting 2 opposite ascendent nerves from 20-26 mm. above the base and having on each side of it 2—3 ascendent nerves free from the base, the external much shorter than the others; petiole about 20 mm. long, sheath basal. *Peduncle* nearly as long as the petiole, glabrous, 2 mm. thick when dry. *Spike*: ♀ about

21 cm. long, rhachis glabrous; bract glabrous, its limb obovate, up to 3 mm. long, more or less prolonged and lacerate at its lower end, widely sessile; ovary free, glabrous, ovate attenuate at the top; stigmas 3—4, linear, acute and recurved. *Berry* sessile, globose and acuminate at the top, black when dry.

PERAK: Maxwell's hill, alt. 4000 ft., September, *Curtis* 2046; at Thaiping, March, *Ridley* 2963, 5480; at Larut, rare, growing closely to the stem of a tree in dense jungle, *King's Collector* 6369; at Maxwell's hill, alt. 3800 ft, Wray 4239. SELANGOR: Semangko pass, April, *Ridley* 15569.

This species will probably, when the male is known, have to be placed in Section SARCOSTEMON perhaps as a form of *P. Korthalsii* Miq. with larger and multinerved leaves, longer spikes and bracts not adnate.

7. PIPER STYLOSUM Miq. in Ann. Bot. Mus. Lugd.-Bat. 1. 139 (1863-64). Erect, 8-24 in. high. Branches densely and retrorsely ochraceo-hirsute, the spiciferous 2 mm. thick; collenchyma continuous, almost entirely libriform; a single central lysigenous canal; sclerosed cells abundant in the pith, less so in the bark. *Leaves* shortly petioled; limb membranous when dry, minutely pellucid-dotted, glabrous above, densely hirsute on the nerves and veins underneath; 11—15 cm. long, 5.5—7 cm. wide; elliptic, acutely acuminate, the base obtuse or subattenuate on one side, rounded and wider on the other side; 7-plinerved, the central nerve emitting 2 opposite or subalternate ascendent nerves, the uppermost from about 5.2 cm. above the base, and having on each side of it 2 ascendent nerves free from the base; petiole 6—8 mm. long, densely hirsute, sheath basal. *Peduncle* nearly equal to the petiole, densely ochraceo-hirsute. *Spike*: ♂ about 20 mm. long, 3 mm. thick, rhachis hirsute; bract glabrous, its limb orbicular, 1 mm. in diam. with a central pedicel; stamens 2, anthers oblong, 4-valvate, much shorter than the oblong filaments: androgynous spike cylindric, about 10 mm. long, white when living, rhachis hirsute; bract glabrous, subobovate-orbicular with a central pedicel; stamens as above; ovary free, glabrous; stigmas 3, ovate. *Berry* ovate, with a rather long conical style. C. DC. in Prodr. XVI. 1. 344. *P. rostratum*, Hook f. Fl. Br. Ind. V. 87 (not Roxb.). *P. birmanicum*, C. DC. in Prodr. XVI. i. 338.

DINDINGS: Gunong Tungul, *Ridley*. PERAK: Larut Hills Tea Gardens, *Curtis* 2049; Maxwell's Hill, *Ridley*; Gunong Batu Putih, alt. 4500 ft., Wray 283; at Kwala Wok, Wray 864; at Larut, *King's Collector*, 2491; in dense jungle, rich soil, 300—500 ft., 7791; *Scor-*



*techini*; Goping, *King's Collector* 415; Kampong Simpai, Batu Pahat, *Lake and Kelsall* 4015. SELANGOR: Gua Batu, Kajang, Kwala Lumpur, *Ridley*.—DISTRIB: Sumatra, Borneo.

8. *PIPER FLAVIBACCUM*, C. DC. in *Records Bot. Surv. Ind.* VI. 5 (1912). Branches glabrous, pale brown when dry, the spiciferous about 1 mm. thick; collenchyma continuous, sparsely libriform; a single central lysigenous canal. *Leaves* moderately long petioled, glabrous, limb rigid, membranous when dry, copiously pellucid-dotted; 10—11 cm. long, 2.8—3.5 cm. wide; oblong-ovate, acutely attenuate, the base inequilateral, attenuate on the shorter, rounded and wider on the longer side; 4-nerved, 2 lateral ascending nerves on one side of the base and a single on the other; petiole 10 mm. long with basal sheath. *Peduncle* glabrous, slender, nearly 20 mm. long. *Spike*: ♂ about 22 mm. long when flowering; rhachis hirsute; bract glabrous, its limb round, 0.5 mm. in diam. with a central short pedicel; stamens 2, anthers rounded, 4-valvate, much shorter than the oblong filaments: ♀ 20 mm. long when ripe. *Berry* free, globose, bright yellow when living, brown when dry, 2 mm. in diam.

PERAK: *Scortechini*; summit of Gunung Batu Putih, alt. 6700 ft., *Wray* 271, 331.

9. *PIPER MINIATUM* Bl. in *Verh. Bat. Genoots.* XI. 166 (1826) and *Enum. Pl. Jav.* 1. 65. Slender creeper, up to 6 m. long. Branches glabrous drying brown, the spiciferous nearly 1 mm. thick; collenchyma in distinct bundles, nearly entirely libriform; a single central lysigenous canal. *Leaves* very shortly petioled; limb rigid-membranous when dry, very minutely pellucid-dotted, 8-18 cm. long, 4-9 cm. wide, shining above, glabrous on both surfaces except at the base where the nerves are at first hirsute and soon glabrous; oblong-ovate, acutely acuminate, slightly inequilateral and very shortly half cordulate at the extreme base the longer side of which is auriciform; 5-7-nerved; petiole hirsute especially at the margins, about 4 mm. long, sheath basal. *Peduncle* glabrous, 26 mm. long, slender. *Spike*: ♂ 10.5 cm. long, up to 7 mm. thick, rhachis hirsute; bract glabrous, its limb round, 0.5 mm. in diam. with a central rather long pedicel; stamens 3, anthers elliptic, 2-valvate, filaments very short: ♀ 10.5—18 cm. long, 4 mm. thick, densely bacciferous, rhachis and bract as in the male; ovary free, glabrous, oblong; stigmas 3, very minute. *Berry* oblong-obovate, angulose, 2 mm. long, bright red when living, black when dry. C. DC. in *Prodr.* XVI. i. 354;

Hook. f. Fl. Br. Ind. V. 85. *P. auriculatum*, Bl. l. c. 171, Enum. 66. *P. glandulosum*, Opiz in Presl Reliq. Haenk. 158. *P. lanceolatum*, Roxb. Fl. Ind. 1. 159. *P. moluccanum*, Spreng. Syst. Veg. 1. 112. *Chavica miniata*, *macrostachya*, *lanceolata*, Miq. Syst. Pip. 234, 236, 264; Ill. Pip. 32, 33. t.t. 28, 29 and Fl. Ind. Bat. 1. ii. 440, 445.

PENANG : *Wallich* 6644 ; between rocks at 500 ft. altitude, *King's Collector* 1533 ; on rocks and trees, *Curtis*. PERAK : Waterfall, *Curtis* 2290 ; at 300 ft. altitude, *Wray* 1959 ; Larut, clings to trees in dense jungle, *King's Collector* 748 ; at 300-600 ft. in open jungle on trees in rocky localities, *Kunstler* 1925. MALACCA : *Maingay* K.D. 1327 ; at Bukit Benang, *Derry* 535, on Mt. Ophir, *Derry* 3152. Johore : Tanjong Kupang, *Ridley* 6426. SINGAPORE : at Toas, *Ridley* 4684.

10. PIPER SEMANGKOANUM, C. DC. in Records Bot. Surv. Ind. VI. 6 (1912). Glabrous in all its parts, spiciferous branches 1.5 mm. thick ; collenchyma in distinct bundles, sparsely libriform ; a central lysigenous canal ; abundant blackish cells in the pith. *Leaves* shortly petioled ; limb membranous when dry, 11.5 cm. long, 5 cm. wide ; ovate, acutely acuminate, the base rounded and equilateral ; 7-plinerved, the central nerve emitting 2 ascendent nerves from nearly 42 mm. above the base and having on each side of it 2 ascendent nerves free from the base ; petiole 5 mm. long, sheath basal. *Peduncle* as long as the petioles. *Spike* : ♀ cylindric, black when dry, 8.5 mm. long, about 2 mm. thick ; bract orbicular, subsessile at its centre ; ovary free, stigmas 4, linear.

PERAK : Maxwell's Hill, *Ridley*. SELANGOR : Semangko pass, *Ridley*.

11. PIPER GYMNOCLADUM, C. DC. in Records Bot. Surv. Ind. VI. 6 (1912). Glabrous in all its parts ; branches drying brown, the spiciferous up to 1.5 mm. thick ; collenchyma libriform, in distinct bundles ; a single central lysigenous canal. *Leaves* shortly petioled ; limb firmly membranous when dry, up to 14.5 cm. long and 6.5 cm. wide, pellucid-dotted, ovate, shortly and acutely attenuate, the base rounded and inequilateral, wider and slightly longer on one side ; 7-plinerved, the central nerve emitting on each side 2 ascendent nerves, the uppermost from 12.5 mm. above the base, and having on each side of it one subascendent short and thin nerve free from the base ; petiole 10 mm. long, of which 2 mm. between the sides of the limb. *Peduncle* up to 22 mm. long. *Spike* : ♀ 16.8 mm. long,

2.1 mm. thick when flowering; bract rounded, 0.52 mm. in diam. with a short central pedicel; ovary free; stigmas 3-4, ovate-oblong, acute at the top. *Berry* sessile, globose, nearly 3 mm. in diam.

PERAK: Maxwell's hill, *Ridley* 5479.

12. PIPER BOEHMERIAEFOLIUM, Wall. Cat. 6654 (1828); C. DC., in Prodr. XVI. i. 348; Hook. f. Fl. Br. Ind. V. 85. *Chavica boehmeriaefolia*, Miq. Syst. Pip. 265; Ill. Pip. 41, t. 37.

Forma *b*, *glabrifolia*, C. DC. n.f. Erect, 0.9-1.2 m. high; branches glabrous, brown when dry, the spiciferous nearly 2 mm. thick; collenchyma continuous, not libriform; no lysigenous canal. *Leaves* moderately long petioled, glabrous; limb membranous when dry, minutely pellucid-dotted, up to 18.8 cm. long and 7.5 cm. wide, oblong-elliptic, acutely acuminate, the base inequilateral, rounded on the longest attenuate on the shortest side; penninerved, the central nerve emitting 5 nerves on the longest and 4 on the other side, the uppermost from 5 cm. above the base, the superior ascendent, the inferior subascendent and more curved; petiole about 6.5 mm. long, of which 2.2-4.4 mm. between the sides of the limb, sheath basal. *Peduncle* 4.4 mm. long, glabrous. *Spike*: ♂ about 28 mm. long, light yellow when flowering, later yellowish-red, rachis hirsute; bract glabrous, its limb round, little less than 2.2 mm. in diam. with a short central pedicel; stamens 3, anthers reniform, 4-valvate, much shorter than the oblong filaments.

PERAK: Larut, at 500-1500 ft. altitude, in dense old jungle on rocky rich soil, *Kunstler* 2231, 2517.

*Var. lanata*, Hook. f. Fl. Br. Ind. l.c. *P. lanatum* Roxb. Fl. Ind. 1. 159, Ed. Carey and Wall. 1. 161; Wall. Cat. 6647; C. DC. in Prodr. 1. 341. *P. Cubeba*, Wall. Cat. 6645 (not Linn.). *P. lonchites*, Wall. Cat. 6644 in part. *P. javanicum*, C. DC. l.c. 343. *Cubeba lanata*, Miq. Syst. Pip. 298; Fl. Ind. Bat. 1. 2. 450. *C. Lowong* var. *quintuplinervis*, Miq. l.c. 298.

Ramlets densely hirsute: structure as in the type except that there are a few sclerosed cells opposite the medullary rays; limb 11-12 cm. long, 3.5-4 cm. wide, the upper surface hirsute principally on the nerves, undersurface and petiole densely hirsute. *Peduncle* up to 2 cm. long.

PENANG: *Wallich* 6647.

*Var. glabra*, Hook. f. l.c.; ramlets and leaves quite glabrous. Limb lanceolate, 4-5 in. long, up to 2 in. wide.

PAHANG : Tahan river, *Ridley* 2259, 2260 ; Ayer Panas, *Derry* 497. PERAK : in dense jungle, clinging to stems of trees, alt. 200-300 ft., *King's Collector* 4184 ; a small pepper 4-5 ft. long, fruit bright red when ripe, *Kunstler* 3411. PROV. WELLESLEY : at 100-300 ft. altitude, a long slender pepper, in dense jungle on trees, fruit red, *Kunstler* 1613 ; *Ridley* 14496.

*Var. humilis* C. DC. n. var. ; shrub about 60 cm. high. Ramlets glabrous, petioles hirtillous ; limb of leaves glabrous. *Berry* globose, nearly 1 mm. in diam.

PERAK : *Wray* 1949 ; *Scortechini*.

*Var. angustifolia*, Miq. ex Hook. f. l.c. ; ramlets and leaves glabrous, lanceolate, 38-42 mm. long, up to 12.5 mm. wide.

MALACCA : *Maingay* K.D. 1333.

13. PIPER LONCHITES, Wall. Cat. 6644 (1828). Erect ? Branches glabrous, smooth, drying brown, the spiciferous 1 mm. thick ; collenchyma libriform in distinct bundles ; a central and several peripheric lysigenous canals. *Leaves* shortly petioled, glabrous ; limb membranous when dry, copiously and minutely pellucid-dotted, 7.6 cm. long and nearly 31 mm. wide, ovate-lanceolate, acutely attenuate, the base very slightly inequilateral, acute on the shortest, subrounded on the longest sides ; 5-plinerved, the central nerve emitting 2 opposite ascendent nerves from nearly 6.3 mm. above the base and having on each side of it one ascendent nerve free from the base ; petiole 3.3 mm. long, sheath basal. *Peduncle* glabrous, very slender, 13.5 mm. long in the male, 19-25 mm. long in the female. *Spike* : ♂ about 12.5 mm. long when flowering ; rhachis hirsute ; bract glabrous, rounded, subsessile at its centre, 1 mm. in diam. ; stamens 3, anthers ovate, 4-valvate, shorter than the adult, oblong, filaments : ♀ about 29.5 mm. long and 2.5 mm. thick ; rhachis and bract as in the male ; ovary free, stigmas 3-4, lanceolate. Miq. Syst. Pip. I. 331 ; C. DC. in Prodr. XVI. i. 358 ; Hook f. Fl. Br. Ind. V. 40 ; non Röm. & Sch. Syst. Mant. 1, 241 quod = *P. lanceolatum*, Roxb. = *P. miniatum*, Bl.

PENANG : *Wallich*. PERAK : *Scortechini*.

Forma *b*, C. DC. n.f. Branches as in the type ; collenchyma almost entirely libriform, a single central lysigenous canal, a zone of sclerosed cells between the masses of phloem of the peripheric fibro-vascular bundles. Limb rigid when dry, the base slightly inequilateral, acute on both sides.

PENANG : *Hook. f. and Thoms.* PERAK : *Scortechini.*

Forma *c*, C. DC. n.f. *P. khasianum*, C. DC. in *Prodr.* XVI. i. 349. Branches slightly costellate; collenchyma libriform, in distinct bundles, a single central lysigenous canal, no sclerous cells.

PERAK : erect, *Ridley* 14497; *Scortechini* 619.

14. PIPER GYMNOPHYLLUM, C. DC. in *Records Bot. Surv. Ind.* VI. 6 (1912). Branches glabrous, dark brown and black-dotted when dry, the spiciferous up to 2 mm. thick; collenchyma partly or quite libriform in distinct bundles. *Leaves* moderately long petioled, glabrous; limb membranous when dry, black-dotted underneath, up to 16 cm. long and 5.5 cm wide, elliptic-lanceolate, acutely acuminate at the top, acute and slightly inequilateral at the base; 6-plinerved, the central nerve emitting 3 ascendent nerves of which 2 on one side, the uppermost from nearly 25.5 mm. above the base, and having on each side of it one ascendent short nerve free from the base; petiole up to 10.5 mm. long with basal sheath. *Peduncles* glabrous, 12.5 mm. long. *Spike*: ♀ nearly half as long as the limb; rhachis fulvescent-hirsute; bract glabrous, rounded, 1.5 mm. in diam., subsessile at its centre; ovary free, ovate, glabrous, stigmas 3-4, linear. *Berry* ovate, 4.2 mm. long, black when dry.

PERAK : Bujong Malacca, *Ridley* 9527.

Perhaps ♀ of *P. eucalyptolimbum*.

15. PIPER PUBERULIRAMEUM, C. DC. in *Records Bot. Surv. Ind.* VI. 7 (1912). Branches sparingly puberulous, drying brown, the spiciferous 1 mm. thick; collenchyma libriform in distinct bundles; a single central lysigenous canal. *Leaves* shortly petioled; limb rigid when dry, copiously pellucid-dotted, 7.5—8.5 cm. long and 2.5 cm. wide, glabrous on both surfaces, ovate-lanceolate, acutely attenuate, the extreme base acute and slightly inequilateral; 5-plinerved, the central nerve emitting 2 ascendent opposite nerves 8.5—10.5 mm. above the base and having on each side of it one ascendent nerve free from the base; petiole puberulous, 8.4 mm. long, of which less than 1 mm. between the sides of the limb, sheath basal. *Peduncles* slender, glabrous, 19 mm. long. *Spike*: ♀ about 3.5 cm. long when fruiting, rhachis densely hirsute; bract glabrous, its limb round, 1.5 mm. in diam., sessile at its centre; ovary free, glabrous; stigmas mostly 4, rounded and short. *Berry* sessile, globose-ovate, nearly 4.2 mm. long, drying black.

PENANG: Government hill, at 2000 ft. altitude, April, *Curtis* 2291; Balik Pulau, March, 8026. SUNGAI UJONG: *Curtis* 2083.

16. *PIPER VELUTINERVIUM*, C. DC. in *Records Bot. Surv. Ind.* VI. 7 (1912). Stem 0·9—2·4 m. high, its lower portion rooting from the nodes; spiciferous branches fulvescent-hirsute when young especially in the male, 4·2 mm. thick; collenchyma libriform in the male and not so in the female, in distinct laterally widened bundles; a single central lysigenous canal. *Leaves* long petioled; limb membranous when dry, copiously pellucid-dotted, glabrous above, velvety-hirtellous underneath on the nerves and veins; up to 22 cm. long and 21 cm. wide; rounded-ovate, acutely acuminate, the base equilateral and deeply cordate; 11-plinerved, the central nerve emitting 2 opposite ascendent nerves from nearly 6·3 mm. above the base, and having on each side of it 5 nerves free and divergent from the base; petiole fulvescent-hirsute and more densely so in the male, 11·5 mm. long, sheath prolonged up to 17 mm. above the base; stipules glabrous. *Peduncle* up to 16·8 mm. long, fulvescent-hirsute in the male, nearly glabrous in the female. *Spike*: ♂ 3·8 cm. long, 4·2 mm. thick; rhachis hirsute; bract glabrous, its limb rounded, 1 mm. in diam. with a central pedicel; stamens 2, anthers subglobose, 4-valvate, much shorter than the oblong and exsert filaments: ♀ up to 5·7 cm. long and 5·2 mm. thick; rhachis hirsute; bract rounded, 1·5 mm. in diam. with a central pedicel; ovary free, ovate, glabrous; stigmas 3, more rarely 4, ovate-oblong. *Berry* sessile, ovate-globose, yellow-red when living, black when dry, 4·2 mm. long.

PERAK: Larut, at 1800-2000 ft. altitude, in open jungle between rocks, August, *King's Collector* 2193, 2196.—DISTRIB. Sumatra.

17. *PIPER SARMENTOSUM*, Roxb. *Fl. Ind. Ed. Car. & Wall.* I. 162 (1820). Erect, 15—45 cm. high, "ramous at top, jointed and smooth, sarmentose shoots issuing in abundance from the top of the root and the lower part of the stem, by which the plant is quickly propagated to any extent" (Roxb. l. c.). Branches minutely puberulous, the spiciferous nearly 1 mm. thick; collenchyma not libriform, in distinct bundles; a single central lysigenous canal. *Leaves* moderately long petioled; limb membranous when dry, minutely pellucid-dotted, about 9 cm. long, and 4·2 cm. wide, glabrous above, minutely puberulous underneath on the nerves, ovate, acutely acuminate, the base rounded, equilateral or very nearly so; 7-plinerved, the central nerve emitting 2 ascendent nerves, the

uppermost from about 8.5 mm. above the base, and having on each side of it 2 nerves from the base, the inner ascendent, the outer sub-ascendent and much shorter than the others; petiole minutely puberulous, 6.3 mm. long, sheath basal. *Peduncle* very minutely puberulous, slender, up to 7.5 mm. long. *Spike*: ♂ about 25 mm. long, 2.5 mm. thick; rhachis hirsute; bract glabrous, its limb rounded, 0.5 mm. in diam. with a central pedicel: ♀ about 16.8 mm. long and 6.3 mm. wide when ripe; rhachis and bract as in the male; ovaries free and very densely condensed, glabrous; stigmas 3, ovate. *Berry* globose, sessile, black when dry, nearly 1 mm. in diam. Spreng. Syst. I. 117; Herb. Willd. n. 682; C. DC. in Prodr. XVI. i. 352. *Chavica sarmentosa*, Miq. Syst. Pip. 242, in Hook. Lond. Journ. Bot. IV. 433, in Fl. Ind. Bat. I. 2. 441, in Suppl. (Sumatra) 186, 473, in Pl. Jungh. I. 16, in Linn. XXI. 482; Wight Ic. t. 1929. *Peperomia sarmentosa*, A. Dietr. Sp. I. 161.

PENANG: *Wallich*. SINGAPORE: roadsides and hedges, *Deschamps*; damp and shady places, *Kunstler* 212.—DISTRIB.: Java, Borneo, Philippine Islands.

18. PIPER SCORTECHINII, C. DC. in Records Bot. Surv. Ind. VI. 8 (1912). Slender creeper, 4.5–6 m. long; branches glabrous, dark brown when dry, the spiciferous 1–1.5 mm. thick; collenchyma not libriform or partly so, in distinct laterally widened bundles; no peripheral lysigenous canal; many rubescent cells in bark. *Leaves* shortly petioled, glabrous; limb membranous when dry, copiously and minutely pellucid-dotted, 12–15.5 cm. long, 3.6–4.8 cm. wide; oblong-elliptic-lanceolate, acutely acuminate, the base attenuate, its sides unequally long in the male, of same length in the female; penninerved, the central nerve emitting from nearly half of its length 7 ascendent nerves of which 3 on the shortest 4 on the longest side of the limb; petiole up to 12.6 mm. long of which 2.1–4.2 mm. between the sides of the limb; sheath prolonged a little above the base of the petiole. *Peduncle* glabrous, slender, 14.7–25.2 mm. long. *Spike*: ♂ 6.5 cm. long, nearly 1 mm. thick when flowering; rhachis hirsute; bract glabrous, rounded-subobovate; stamens 2, anthers elliptic, 2-valvate, filaments very short: ♀ about 7.6–15.6 cm. long when ripe; rhachis and bract as in the male; ovary free, glabrous, ovate; stigmas 3, linear. *Berry* sessile, subobovate-globose, shortly mucronate, 4.2 mm. long, black when dry.

PERAK: on Maxwell's hill, at 3000 ft. altitude, March, *Scorte-*

*chini* 285; Larut at 2800-3000 ft. altitude, August, *King's Collector*, 3230; on limestone hills at Goping 300—500 ft. altitude, 5906.

19. PIPER LONGUM, Linn. Sp. Pl. 29 (1753) (*exclus.* Syn. Rumph.). Creeping below, flowering shoots erect. Branches glabrous, pale brown when dry, the spiciferous 1 mm. thick; collenchyma in distinct bundles, libriform in its inner zones; a single central lysigenous canal. *Leaves* shortly petioled; limb membranous when dry, copiously pellucid-dotted, about 6—10 cm. long and 2.5—3.5 cm. wide, glabrous above, minutely pubescent on the nerves underneath; oblong-ovate, acutely acuminate, the base cordate equilateral or slightly wider on one side than on the other; 5—7-nerved, the 3 central nerves stouter than the others; petiole minutely pubescent, about 6 mm. long in the upper leaves, sheath basal. *Peduncle* minutely pubescent, 21—24 mm. long in the male, 12.6—14.6 mm. in the female. *Spike*: ♂ up to 5.5 cm. long and 3 mm. thick; rhachis glabrous; bract glabrous, its limb rounded 1.5 mm. in diam., with a rather long central pedicel; stamens 2, anthers elliptic, filaments short: ♀ about 15 mm. long and up to 4.5 mm. thick when flowering; rhachis and bract as in the male; ovary partly imbedded in the rhachis, its upper portion free and glabrous; stigmas 3, ovate-acute. *Berry* partly imbedded in the rhachis, its upper free portion glabrous and globose, 2 mm. in diam., blackish when dry. *P. longum Pistolochiae* Pluk. Almag. 297, Phyt. t. 104, fig. 4, Herb. Pluk. 97, fol. 105; 'Cattu tirpali,' Rheedee, *Hort. Mal.* VII. 27, t. 14. *P. foliis cordatis petiolatis sessilibusque*, Linn. Fl. Zeyl. 30. *P. longum*, Herb. Burm. 4, fig. 3; Hill Dict. 26, 17. t. 17 fig. 1; Vahl Enum. I. 334; Willd. Sp. Pl. 1. 161; Herb. Willd. n. 698, fol. 1; Roxb. Fl. Ind. I. 156; Lour., Fl. Cochinch. 40; C. DC. in Prodr. XVI. i. 355; Hook. f. Fl. Brit. Ind. V. 83. *Chavica Roxburghii*, Miq. Syst. Pip. 239; Ill. Pip. 35, t. 30; in Hook. Lond. Journ. IV. 433; in Linn. XX. 130; in Fl. Ind. Bat. I. ii. 430; Hayne Arnz. Gewachs. XIV. t. 20.

PENANG: *Curtis* 837; near the bank of Kuila river, *King's Collector* 385. SELANGOR: Langat, *Ridley* 399. PAHANG: Pekan, *Ridley* 1004.—DISTRIB.—India, Malay Archipelago.

20. PIPER SUBFRAGILE, C. DC. in Records Bot. Surv. Ind. VI, 9 (1912). Scandent. Branches glabrous, light brown when dry, the spiciferous 0.5 mm. thick; collenchyma in distinct bundles, libriform: a central and several lysigenous canals. *Leaves* shortly



petioled, glabrous; limb subcoriaceous when dry, copiously pellucid-dotted, 5.5 cm. long, 3.6 cm. wide, ovate, shortly and subacutely attenuate, the base rounded, both sides of same width, one slightly longer than the other; 7-plinerved, the central nerve emitting 2 ascendent opposite nerves from nearly 8.4 mm. above the base, and having on each side of it 2 nerves free from the base, the inner ascendent, the outer subascendent; petiole 6.6 mm. long, of which 2.1 between the sides of the limb. *Peduncle* glabrous, 3.3 mm. long when still young. *Spike*: ♀ 10.5 mm. long, 2 mm. thick; rhachis hirsute; limb of bract rounded, glabrous with a central hirsute pedicel; ovary glabrous, its lower portion imbedded in the rhachis:—

PERAK: Kurau, in the plains, May, *Wray* 4262.

A species very much like *P. fragile*, Bentham, from which it differs by the structure of the branches.

21. PIPER MINUTISTIGMUM, C. DC. in Records Bot. Surv. Ind. VI. 9 (1912). A very large pepper, 9—12 m. long. Branchlets glabrous, light brown when dry, the spiciferous up to 3 mm. thick; collenchyma continuous, its inner zone sparingly libriform; no peripheric lysigenous canal; very abundant fuscous cells in bark and pith. *Leaves* moderately long petioled, glabrous; limb rigid when dry, minutely and sparingly pellucid-dotted, 13.5 cm. long, 7 cm. wide; ovate, acutely acuminate, the base rounded, both sides of same width but unequally long; 9-plinerved, the central nerves emitting 2 alternate ascendent nerves, the uppermost from 16.5—19.8 mm. above the base, and having on each side of it 3 nerves free from the base, all nerves prominent underneath; petiole 19 mm. long of which 6.3 mm. between the sides of the limb, sheath basal. *Peduncle* glabrous 5.8—7.7 cm. long. *Spike*: ♀ cylindric about 9 cm. long and nearly 4 mm. thick when ripe; rhachis velutino-puberulous; bract glabrous, its limb ovate-rounded 1.5 mm. long, with a very short and thick pedicel inserted below its centre; ovary deeply imbedded in the rhachis, convex and velutino-puberulous in its upper free portion; stigmas 3 minute. *Berry* subquadrangular at the apex.

PERAK: Larut, September, *King's Collector* 2388; *Scortechini*.

22. PIPER BETLE, Linn. Sp. Pl. Ed. 1, 28 (1753). Scandent. Branches glabrous, brown when dry, the spiciferous 0.5 mm. thick; collenchyma continuous or subcontinuous, partly libriform; a central and several peripheric lysigenous canals, abundant brown cells in bark and pith. *Leaves* glabrous; limb membranous when dry,

very minutely pellucid-dotted, 10—13 cm. long, 45—90 mm. wide; ovate or rounded-ovate, acutely acuminate, the base equilateral, rounded or more or less cordate in the inferior leaves, 5-plex—9-plex-nerved, the central nerve emitting on each side 1—2 ascendent nerves, the uppermost from about 20 mm. above the base, and having on each side 1—2 nerves free from the base, the external less ascendent and much thinner than the others; petiole 15—35 mm. long with a sheath prolonged up to  $\frac{1}{4}$ — $\frac{1}{2}$  of its length. *Peduncle* glabrous, as long as the petiole in the male and longer than it in the female. *Spike*: ♂ nearly as long as the limb; rhachis tomentose; bract glabrous, its limb rounded or obovate, sessile at its centre; anthers elliptic, 4-valvate; filaments short, of same width as the anthers: ♀ about 5 cm. long and 10 mm. thick when ripe; rhachis tomentose; bract as in the male; base of the ovary imbedded in the rhachis, stigmas 4—5, lanceolate; *Berry* convex and tomentose in the upper part.

Vahl Enum. I. 328; Willd. Sp. Pl. I. 159; Roxb. Fl. Ind. Ed. Car. & Wall. I. 160; C. DC. in Prodr. XVI. i. 359; Hook. f. Fl. Br. Ind. V. 85 (excluding Ic. Wight and Syn. *Ch. Chuvya*, Miq.); Bot. Mag. t. 3132 (excluding fruit analysis). *Chavica Belle*, Miq. Syst. Pip. 186. *Ch. auriculata*, Miq. Syst. 269. *Aetanthus hexagyna*, Miq. Syst. Pip. 412.

Cultivated in the hotter and damper parts of India, Ceylon, the Malay Peninsula, Andamans and Nicobar Islands, Oceania.

Forma *b*, C. DC. in Philipp. Journ. Sc. V. 431. *P. Bette* var.  $\gamma$  *densum* in C. DC. Prodr. l.c. 360; limb more ovate and less equilateral at the base.

PENANG: Balik Pulau, *Ridley* 8029. PERAK: Waterloo, at 1500 ft. altitude, *Curtis* 2701. SELANGOR: Kwala Lumpur, *Curtis* 2368, 2369. SINGAPORE: Vern. "Sirih Batek," *Ridley* 4684.—DISTRIB.: ANDAMANS: *King's Coll.* 322. NICOBARS: *Kurz*.

23. PIPER FEBRIFUGUM, C. DC. in Records Bot. Surv. Ind. VI. 10 (1912). Scandent. Branches densely fulvescent-villose, the spiciferous 4 mm. thick; collenchyma continuous and libriform; no peripheric lysigenous canal, or zone of globose sclerous cells between the collenchyma and the peripheric fibrovascular bundles. *Leaves* shortly petioled; limb firmo-membranaceous when dry, nearly 22.5 cm. long and 13 cm. wide; glabrous above, shortly and rather densely hirsute underneath; ovate, acutely acuminate, the base cordate with round unequally long and wide lobes inserted at the same level on the

petiole; 13-plinerved, the central nerve emitting 3 pairs of opposite ascendent nerves, the uppermost from nearly 9 cm. above the base, and having on each side of it 3 divergent nerves free from the base; petioles 10 mm. long, densely villous. *Peduncle* minutely puberulous, 45 mm. long. *Spike*: ♀ about 16·5 cm. long, 3·5 mm. thick when flowering; rhachis hirsute; bract glabrous, its limb round with a short central and thick pedicel; ovary half imbedded in the rhachis, umbonate and glabrous above; stigmas 3, ovate-acute. *Berry* black when dry.

SUNGEI UJONG: Vern. "Akar Sangkap," *Cantley* 1867.

The roots when boiled are given in cases of fever.

24. *PIPER PORPHYROPHYLLUM*, N. E. Brown in Gard. Chron. (1884) XXII. 438. Scandent. Branches glabrous, the spiciferous 0·5 mm. thick; collenchyma libriform, in distinct bundles; a single central lysigenous canal. *Leaves* moderately long petioled, glabrous; limb membranous when dry, marble pink underneath when living, nearly 10·5 cm. long and 4·5 cm. wide, elliptic, shortly and acutely acuminate, the base acute and shortly inequilateral; 7-plinerved, the central nerve emitting 2 ascendent nerves, the uppermost from nearly 2·5 cm. above the base, and having on each side of it 2 ascendent nerves free from the base; petiole 8·5 mm. long of which 1 mm. between the sides of the base. *Peduncle* up to 17 mm. long, glabrous. *Spike*: ♂ a little longer than the limb, rhachis hirsute; bract glabrous, oblong, adnate, free at the margin, rounded at both ends; stamens 3, anthers small obovate, filaments very slender: ♀ up to twice as long as the limb, rhachis and bract as in the male; ovary free, glabrous, stigmas 4 linear. *Berry* ovate, attenuate at the apex, 5 mm. long, reddish-black and longitudinally wrinkled when dry. *P. nigrum?*, Wall. Cat. 6643 E, F, ex Hook. f. in Fl. Br. Ind. V. 96. *Cissus? porphyrophyllus*, Lindl. in Journ. Hort. Soc. I. 225 and Fl. des Serres Ser. 2, IV. t. 1491 (a sterile specimen).

PERAK: Hijau range, *Curtis* 2048. DINDINGS: *Ridley* 3035. Malacca, Singapore and Penang, *Wallich* 6643.

Found in the whole Peninsula from *Tringganu* to Singapore.

25. *PIPER NIGRUM*, Linn. Sp. Pl. Ed. 1, 28 (1753). Climbing, quite glabrous. Branches terete, the spiciferous 2—3 mm. thick; collenchyma libriform, continuous, in a thin layer; a central and many peripheric lysigenous canals. *Leaves* moderately long petioled; limb coriaceous, more or less glaucous underneath, minutely pellucid-

dotted, 11—15 cm. long, 5—9 cm. wide, a little narrower on one side of the central nerve than on the other side; ovate-elliptic, acutely acuminate, the base subattenuate and equilateral; 7-plinerved, the central nerve emitting 2 ascendent nerves, the uppermost from about 35 mm. above the base, and having on each side of it 2 ascendent nerves free from the base, the outer much shorter and less ascendent than the others; petiole 2—3 cm. long, with sheath prolonged up to its middle or a little higher. *Peduncle* nearly as long as the petiole. *Spike* about as long as the limb; bracts linear-oblong, adnate to the rachis and free from it only at the margins, the lower end obtuse, the upper more rounded; flowers commonly unisexual and dioecious, more rarely bisexual, surrounded by a sort of calicule formed by the ends of the adjacent bracts; stamens 2, anthers rounded-reniform much shorter than the fleshy filaments; ovary free, rounded, stigmas 3—4, rarely 5, lanceolate. *Berry* sessile, globose; red when fresh, drying black, 3—4 mm. in diam. Vahl Enum. I. 329; Roxb. Fl. Ind. I. 150 and Ed. Carey & Wall. I. 153; Blume in Verh. Bat. Genoots. XI. 191, f. 11—17; Miq. Syst. Pip. 308, Ill. Pip. 50, t. 50; C. DC. in Prodr. XVI. i. 363; Hook. f. Fl. Br. Ind. V. 90; Hayne Arnz. Gewachs. XIV. t. 6; Bot. Mag. t. 3139; Schitzl. Icon. II. t. 81.

Cultivated in the damp parts of India, Ceylon, the Malay Archipelago and most other tropical countries.

Var. *subpenninervis* C. DC. *n. var.*, limb elliptic-lanceolate 17·5 cm. long, 7·5 cm. wide, acutely and rather long acuminate, the base equilateral, acute, the central nerve emitting 4 ascendent nerves, the uppermost from nearly 6 cm. above the base, and having on each side of it one ascendent nerve free from the base; flowers bisexual, stamens 3. *Berry* elliptic-globose, attenuate and acute at the apex, 4 mm. long.

DINDINGS: Gunong Tungul, *Ridley* 8018. PERAK: *Ridley* 8027, 8382; Waterloo, *Curtis* 2700. SELANGOR: high cave Gua Batu, *Curtis* 8180.—DISTRIB.: Tenasserim, *Helfer* 4425.

26. PIPEER FLAVISPICUM, C. DC. in Records Bot. Surv. Ind. VI. 10 (1912). Erect, 2 feet high. Branches glabrous, the spiciferous about 1·5 mm. thick; collenchyma libriform, in distinct and rather thick bundles; a single central lysigenous canal. *Leaves* very shortly petioled, glabrous; limb membranous when dry, minutely pellucid-dotted, 13—15 cm. long and 4·5—5·5 cm. wide, elliptic-lanceolate, rather long acuminate, the base acute and equilateral; 7-plinerved, the central nerve emitting 2 alternate ascendent nerves, the upper-

most from nearly 4 cm. above the base, and having on each side of it 2 lateral ascendent nerves free from the base, the external much shorter and thinner than the others; petiole 4 mm. long with basal sheath. *Peduncle* glabrous, 6.3 mm. long. *Spike*: ♂ 5.6 cm. long, 1 mm. thick, rhachis glabrous; bract glabrous, its limb oblong-obovate, 2.5 mm. long, up to 1.5 mm. wide; stamens 3, anthers ovate, 4-valvate, nearly as long as the oblong filaments: ♀ 5.6 cm. long and yellow when ripe; bract as in the male. *Berry* free-ovate, 4 mm. long, drying black.

PERAK: Sunga Pnya, near a small limestone hill in dense jungle, *King's Collector* 1004.

27. PIPER LONGICAULE, C. DC. in Records Bot. Surv. Ind. VI. 11 (1912). Climber, 6—7 cm. long, clinging to trees and shrubs. Branches glabrous, light brown when dry, the spiciferous 1 mm. thick; collenchyma libriform, in distinct thin bundles; a single central lysigenous canal. *Leaves* moderately long petioled, glabrous; limb rigid-membranous when dry, minutely and inconspicuously pellucid-dotted; 7.5—10 cm. long, 3.5—4 cm. wide, elliptic-lanceolate, acutely acuminate, the base subacute and slightly longer on one side than on the other; 7-plinerved, the central nerve emitting 2 alternate ascendent nerves, the uppermost from 12—14 mm. above the base, and having on each side of it 2 ascendent nerves free from the base, the external much thinner and shorter than the others; petiole nearly 7 mm. long, sheath basal. *Peduncle* glabrous, about 12 mm. long, 0.5 mm. thick. *Spike*: ♂ nearly 8 cm. long and 1 mm. thick; flowers almost verticillate; rhachis hirsute; bract adnate, obovate-oblong, 1.5 mm. long, obtuse at the lower end, rounded or shortly attenuate at the apex, minutely puberulous on the back and ciliolate at the free margins; stamens 3, anthers obovate, 4-valvate, little longer than the oblong filaments: ♀ up to 19.5 cm. long, white on the living plant when flowering; rhachis hirsute 1.5 mm. thick; bract 2.5 mm. long, otherwise as in the male; ovary free, glabrous; stigmas 4—5, linear, acute, recurved. *Berry* ovate, subacute at the apex, nearly 2.5 mm. long, yellow or red when living, brown when dry.

PENANG: *Curtis* 1318. PERAK: Ulu Slim at 500—800 ft. altitude, in dense jungle and on rocky soil, *King's Collector* 10673; *Scortechini*; Larut, at 1000—3000 ft. altitude, *King's Collector* 2545; 4048, 5876; Kota, Larut, in plains, August, *Wray* 2857; Tapa 1347. MALACCA: *Mairgay* K.D. 1335.—DISTRIB. INDIA, *Wight* 2556.

28. *PIPER KOTANUM*, C. DC. in Records Bot. Surv. Ind. VI. 11 (1912). Branches glabrous, blackish when dry, the spiciferous 1 mm. thick; collenchyma libriform, continuous; a single central lysigenous canal. *Leaves* shortly petioled; limb rigid-membranous when dry, minutely pellucid-dotted; up to 12 cm. long and 5 cm. wide; glabrous above, velutino-puberulous underneath; elliptic, acutely acuminate, the base slightly inequilateral, acute on the shortest, rounded on the longest side; penninerved, the central nerve emitting on each side 3 ascendent nerves, the uppermost from 31·5—37·5 mm., the lowest from a little above the base; petiole glabrous, up to 8·5 mm. long. *Spike*: ♀ 6·4 cm. long, 1 mm. thick; rhachis glabrous; bract glabrous, elliptic, adnate to the rhachis and free only at the margins, a little over 1 mm. long and 0·25 mm. wide; ovary free; stigmas 3, triangular, acute at the apex. *Berry* globose, nearly 3 mm. in diam., black when dry.

PERAK: Kota, in the plains, Wray 1947.

29. *PIPER LEPTONEMA*, Hook. f. Fl. Br. Ind. V. 91 (1885) *excl. specimens of Zollinger*. Scandent. Branches glabrous, drying brown, the spiciferous 1 mm. thick, in those 2 mm. thick collenchyma libriform in distinct thin and laterally widened bundles; a single central lysigenous canal. *Leaves* moderately long petioled, glabrous; limb membranous when dry, minutely pellucid-dotted, about 10·5 cm. long and 4·5—6·5 cm. wide in the male, 7·6—10 cm. long and 4·4—5 cm. wide in the female; elliptic, acutely acuminate, the base rounded and nearly equilateral; 7-plinerved, the central nerve emitting 2 ascendent nerves, the uppermost from 12·5—14·7 mm. above the base and having on each side of it 2 nerves free from the base, the inner ascendent, the outer subascendent, much shorter and thinner than the others; petiole 8·5—12·5 mm. long, sheath basal. *Peduncle* glabrous, very slender, 12·6—14·7 mm. long. *Spike*: ♂ nearly 9 cm. long, flowers obliquely verticillate; rhachis hirsute with no lysigenous canal; bracts oblong, rounded at both ends, adnate, very tightly condensed, raised but not thinned at the lateral margins, free only at the ends, very minutely puberulous and ciliate, the adnate surface containing large lysigenous cells; stamens 3, anthers exsert, obovate-elliptic, 4-valvate, shorter than the oblong filaments: ♀ nearly up to 13 cm. long, rhachis and bract as above, ovary glabrous, ovate, prolonged at the apex into a short and thick style, stigmas 4—5, oblong, subulate at the top. *Berry* sessile, oblong-ovate, with a short and thick style, 4·2 mm. long, black when dry.

PERAK: Larut at 1200 ft. altitude, November, *Kunster* 2557; in dense jungle, rocky soil, at 600—800 ft. altitude, a long creeper over 50 feet long, *King's Collector* 1067, male specimens; *Wallich*, female specimen in Herb. Calcutta.

With its bracts the lateral margins of which are not thinned, this species is somewhat intermediate between sections EUPIPER and MULDERA.

30. PIPER DINDINGSANUM, C. DC. in Records Bot. Surv. Ind. VI. 12 (1912). Branches glabrous, the spiciferous 2 mm. thick; collenchyma nearly continuous and partly libriform; a central and several peripheric lysigenous canals. *Leaves* moderately long petioled, glabrous; limb membranous when dry, up to 12.5 cm. long and 6.5 cm. wide, ovate, acutely acuminate, the base equilateral and rounded or repand subcordate; 7-plinerved, the central nerve emitting 2 opposite ascendent nerves from about 10 mm. above the base, and having on each side of it 2 subascendent nerves from the base, the external much thinner than the others; petiole 10 mm. long with a basal sheath. *Peduncle* 14.7 mm. long, glabrous. *Spike*: ♀ 16.8 mm. long when ripe, rhachis hirtillous; bract glabrous, its limb rounded, 1 mm. wide with a central moderately long pedicel containing gelified cells; ovary free, glabrous, ovate; stigmas 3 linear. *Berry* obovate-globose, 3 mm. long, black when dry.

DINDINGS: July, *Ridley* 8370.

31. PIPER CANINUM, Blume in Verh. Batav. Genoots. XI. 214, f. 26 (1862). Scandent. Branches glabrous, branchlets brown when dry, shortly hirtillous when young in the male, more densely and longer hirsute in the female, the spiciferous nearly 0.5 mm. long in the male 1 mm. in the female; collenchyma in distinct bundles, its internal zone libriform; a single row of intramedullar bundles; a single central lysigenous canal in the male and a few peripheric in the female; an interfascicular zone of sclerosed cells opposite the medullary rays in the male. *Leaves* shortly petioled; the limb membranous and with pellucid dots when dry, glabrous above more or less pilose underneath; up to 11 cm. long and up to 23 mm. wide in the male and to 4 cm. in the female; ovate-oblong, acutely acuminate, the base equilateral attenuate; 5-plinerved, the central nerve emitting 2 ascendent nerves the uppermost from 10.5 mm. above the base, and having on each side of it one ascendent nerve free from the base; petiole slender, up to 10.5 mm. long with basal sheath. *Peduncle* as long as the petiole, puberulous. *Spike*: ♂ many times shorter than

the limbs; rhachis hirsute; limb of the bract rounded, hirtillous above and ciliate with a central short pedicel; stamens 2, anthers globose, 4-valvate: ♀ many times shorter than the limbs; rhachis and bracts as in the male; ovary free, glabrous, stigmas 3—4, ovate, acute. *Berry* ovate-globose, black and 5 mm. long when dry, its stipe nearly of same length. A. Dietr. Sp. Pl. I. 681; C. DC. in Prodr. XVI. i. 341; Hook. f. Fl. Br. Ind. V. 82; C. DC. in Philipp. Journ. Sc. V. 458. *P. Cubeba* Vahl Enum. I. 332; Roxb. Fl. Ind. I. 159 and Ed. Carey & Wall. I. 161; Wall. Cat. 6645. *Cubeba canina*, Miq. Comm. Phyt. 33, t. 3, Syst. Pip. 293, Fl. Ind. Bat. I. ii. 449 and Ann. Mus. Bot. Lugd. Bat.-fasc. V. 137.

PERAK: at Gunung Bintang, *Kunstler* 281; in Upper Perak alt. 300 ft., *Wray* 3606; at Kwala Wok, *Wray* 853; at Bukit Tungul, *Ridley* 3356. SINGAPORE: *Ridley* 4686; at Selitar, *Ridley* 4688; *Ridley* 6425; Tanjong Katong, jungle by road to Siglap, *Ridley*.

32. PIPER MALACCENSE, C. DC. in Records Bot. Surv. Ind. VI. 12 (1912). Branches hirsute when young, glabrous afterwards; the spiciferous 1.5 mm. thick; collenchyma continuous, not libriform; a central and many peripheric lysigenous canals. *Leaves* shortly petioled; limb membranous when dry very minutely pellucid-dotted, up to 17.5 cm. long and nearly up to 6 cm. wide, hirsute on both surfaces on the nerves; elliptic-lanceolate, acutely and rather long acuminate, the base slightly inequilateral, acute or rounded on the longer side; penninerved, the central nerve emitting on each side 3 ascendent nerves, the uppermost from about 5.5 cm. above the base; petiole densely hirsute, 7 mm. long, of which 2 mm. between the sides of the limb, sheath basal. *Peduncle* hirsute, nearly as long as the petiole. *Spike* 3 cm. long; rhachis hirsute; bract glabrous, its limb rounded 1.5 mm. in diam.; flowers sometimes bisexual, then stamens 1—2, anthers rounded; ovary free, ovate, glabrous; stigmas 4, linear, acute. *Berry* globose, 3 mm. long, black when dry, much longer than its stipe.

MALACCA: Vern. "Poku Pimpin," *Ridley* 2338; at Merliman, *Ridley* 1617.

33. PIPER SELANGORENSE, C. DC. in Records Bot. Surv. Ind. VI. 13 (1912). Scandent. Branches glabrous, slender, the spiciferous 1 mm. thick, greenish when dry; collenchyma in distinct laterally widened bundles, partly libriform; a single central lysigenous canal; many fulvescent cells in pith and bark. *Leaves* shortly petioled,



glabrous; limb rigid-membranous when dry, copiously and minutely reddish-pellucid-dotted, up to 9 cm. long and 4.5 cm. wide, oblong-ovate and subobtusely acuminate, the base rounded, both sides of same length one of them wider than the other; 5-nerved, the central nerve emitting many strong patulous veins and having on each side of it 2 ascendent nerves free from the base, the outer much thinner than the inner; petiole about 6 mm. long. *Peduncle* 12 mm. long, slender, glabrous. *Spike*: ♀ nearly 26 mm. long, rhachis hirtillous; bract glabrous, its limb obovate, 3 mm. long with a thick central pedicel containing gelified cells; ovary free, ovate; stigmas 3, oblong, short and blunt. *Berry* stipitate, black when dry, about 4 mm. long, its stipe 3 mm. long.

SELANGOR: Semangkoh, Sempang Mines, *Ridley* 15565.

34. *PIPER SUBALBICANS*, C. DC. in *Records Bot. Surv. Ind.* VI. 13 (1912). Branches glabrous, drying brown, the spiciferous 1.5 mm. thick; collenchyma partly libriform in distinct bundles; a single central lysigenous canal; numerous orange-coloured cells in bark and pith. *Leaves* glabrous, moderately long-petioled; limb membranous and pale when dry, whitish underneath when living, up to 12.5 cm. long and 58 mm. wide; oblong-ovate, acutely acuminate, the base slightly inequilateral, rounded on the longest attenuate on the shortest side; 7–9-plinerved, the central nerve emitting on each side 2–3 ascendent nerves, the uppermost from 26–39 mm. above the base, and having on each side of it one ascendent nerve free from the base; petiole slender, up to 10 mm. long of which 2 mm. between the sides of the limb, sheath slightly prolonged above the base of the petiole. *Peduncle* very slender, glabrous, about 10–12 mm. long. *Spike*: ♀ nearly 32 mm. long; rhachis hirsute; bract glabrous, obovate, subattenuate towards its lower end, 3 mm. long, up to 1 mm. wide, sessile above its centre; ovary free, glabrous, ovate; stigmas 3, ovate, short. *Berry* elliptic and longer than its stipe while still young, drying black.

PERAK: Gunong Batu Putih, lower camp, at 3400 ft. altitude, *Wray* 448.

35. *PIPER CURTISII*, C. DC. in *Records Bot. Surv. Ind.* VI. 14 (1912). Slender creeper, 3–4.5 m. long, clinging to the stems of trees. Branches glabrous, the spiciferous up to 1 mm. thick; collenchyma continuous, partly libriform; a single central lysigenous canal; numerous yellow cells in bark and pith. *Leaves* moderately long-petioled,

glabrous ; limb membranous when dry, copiously black-dotted underneath, 9—11.5 cm. long 3.7—4.5 cm. wide, subobovate-elliptic-lanceolate, acutely acuminate, the base equilateral and acute ; 5-plinerved, the central nerve emitting 2 ascendent nerves from about 2 mm. above the base with many spreading veins higher up, and having on each side of it one ascendent nerve free from the base ; petiole very thin, 10 mm. long, sheath basal. *Peduncle* glabrous, very thin, as long as the petiole. *Spike*: ♀ slender, 4 cm. long ; rhachis hirsute ; bract glabrous, its limb elliptic 2 mm. long with a central short and thick pedicel containing gelified cells ; ovary free, glabrous ; stigmas 3—4, ovate-acuminate. *Berry* globose, yellowish-red when living, black when dry, nearly 4 mm. in diam., its stipe a little shorter.

PERAK : at Waterloo in May, *Curtis* 2699 ; at Larut at 2500—3000 ft. altitude, *King's Collector* 6263 ; *Scortechini*. SELANGOR : Kwala Lumpur, *Curtis*. MALACCA : where Vern. "Akar Siri Haton", *Ridley* 2337.

36. PIPER PAUCISTIGMUM, C. DC. in Records Bot. Surv. Ind. VI. 14, (1912). Slender creeper ; branches glabrous, the spiciferous nearly 1 mm. thick ; collenchyma libriform in distinct laterally much widened bundles ; a single central lysigenous canal ; numerous yellow cells in bark and pith. *Leaves* moderately long-petioled, glabrous ; limb membranous when dry, copiously blackish-dotted underneath, up to 10.5 cm. long and 32 mm. wide ; oblong-elliptic, acutely acuminate, the base equilateral and acute ; 5-plinerved, the central nerve emitting 2 ascendent nerves, the uppermost from about 26 mm. above the base, and having on each side of it one ascendent nerve free from the base ; petiole very slender, 8.4 mm. long, sheath basal. *Peduncle* very slender, as long as the petiole, glabrous. *Spike*: ♀ nearly 4 cm. long ; rhachis puberulous ; bract glabrous, its limb obovate, 1 mm. long and up to 1 mm. wide, with a central short pedicel ; ovary free, glabrous ; stigmas 2 or 3, ovate-acuminate. *Berry* sealing-wax red when living, black when dry, globose, nearly 3 mm. in diam., its stipe shorter.

PERAK : near Ulu Kerling, April, on trees in dense bamboo forest, at 500—700 ft., *King's Collector* 8820 ; *Scortechini*.

37. PIPER MAXWELLANUM, C. DC. in Records Bot. Surv. Ind. VI. 15 (1912). Scandent. Branches glabrous, light brown when dry, the spiciferous 2 mm. thick ; collenchyma continuous and libriform ; a single central lysigenous canal ; numerous orange-coloured cells in

bark and pith. *Leaves* moderately long-petioled, glabrous; limb membranous when dry, reddish-dotted underneath, up to 7.5 cm. long and 36 mm. wide; elliptic-lanceolate, acutely acuminate, equilateral and acute at the base; 7-plinerved, the central nerve emitting on each side 2 ascendent nerves, the uppermost from 26 mm. above the base, and having on each side of it one ascendent nerve free from the base; petiole slender, 11 mm. long, sheath basal. *Peduncle* glabrous, slender, 8-14 mm. long. *Spike*: ♀ about 36 mm. long, rachis hirtillous; bract glabrous, obovate, 1.5 mm. long and up to 1.5 mm. wide, shortly pedicellate above its centre, the pedicel containing gelified cells; ovary free, ovate, glabrous; stigmas 3, ovate-acute. *Berry* stipitate, globose, transparent and red when living, black when dry, about 4 mm. in diam., the stipe a little shorter.

PERAK: Maxwell's hill, at 2500 ft., Wray 1734.

38. PIPER PEDICELLOSUM, Wall. Cat. 6646 A. (1828). Scandent. Branches glabrous, dark brown when dry, the spiciferous 2 mm. thick; collenchyma libriform in distinct often laterally much widened bundles; a central and one or two peripheric lysigenous canals; sclerosed cells in the bark between the masses of phloem of the peripheric fibro-vascular bundles. *Leaves* shortly petioled, glabrous; limb subcoriaceous when dry, copiously pellucid-dotted, 9 cm. long, 38-44 mm. wide; ovate, obtusely acuminate, the base cordate and slightly inequilateral; 7-9-plinerved, the central nerve emitting on each side 2 pairs of ascendent opposite nerves, the uppermost from only 6 mm. above the base, and having on each side of it 1-2 nerves free from the base, the external more curved and thinner than the others; petiole 6.3 mm. long of which 2 mm. between the sides of the limb. *Peduncle* glabrous, 8-9 mm. long, 4.5 mm. thick. *Spike*: ♀ 2.5-4 cm. long, rachis hirsute; bract puberulous on the back and ciliolate on the margins, adnate above its centre, oblong-obovate, attenuate and subacute toward the lower end; ovary free, ovate, glanduloso-asperulate; stigmas 4 or more rarely 3, ovate oblong and acute. *Berry* globose, yellowish-red when living, black when dry, 5 mm. in diam., its stipe 6 mm. long, very minutely puberulous. C. DC. in Prodr. XVI. i. 343, exclud. spec. *P. Lambertii*; Hook. f. Fl. Br. Ind. V. 81. *Cubeba Neesii*, Miq. Syst. Pip. 292.

PERAK: Larut, at 100 ft. a large pepper 60-100 ft. long clinging to trees, February, King's Collector 5571; at alt. 1200-1500 ft., King's Collector 10761. MALACCA: at Ayer Panas, November, Ridley

1612. SINGAPORE: *Wallich* 6646 A.—DISTRIB. Assam, Andaman Islands.

Forma *b*; limb yellow when dry, uppermost pair of lateral nerves emitted from 26 mm. above the base.

ANDAMANS: Goplakabang, *King's Collector*.

39. PIPER RIBESIOIDES, Wall. Pl. As. Rar. I. 79, t. 9 (1830) and Cat. 6637 (1828). Scandent. Branches pale when dry, glabrous, the spiciferous about 4 mm. thick; collenchyma continuous, libriform; a central and several peripheric lysigenous canals. *Leaves* very large, moderately long-petioled, glabrous; limb coriaceous and pale brown when dry, about 25 cm. long, 11 cm. wide; oblong-ovate, acutely acuminate, the base equilateral, deeply cordate; 9—13-plinerved, the central nerve emitting 1—3 ascendent nerves, the uppermost from about 9 cm. above the base, and having on each side of it 3 nerves free from the base; petiole about 4—5 cm. long and 5 mm. thick, sheath basal. *Peduncle* glabrous, about 8.4 mm. long and 2 mm. thick. *Spike*: ♀ 6—8 cm. long; rhachis hirsute; bracts glabrous, adnate, free at the margin, oblong, rounded at both ends; ovary free, ovate-oblong, glabrous; stigmas 3, oblong, acuminate, recurved. *Berry* globose, about 6 mm. long, its stipe nearly of same length. C. DC. in Prodr. XVI. 1. 342; Hook. f. Fl. Br. Ind. V. 81. *Cubeba Wallichii*, Miq. Syst. Pip. 289, Ill. Pip. 47, tab. 46, 47.

KEDAH: Langkawi, Gunong Raya, *Curtis* 2541. PERAK: at 300 ft. altitude, *Wray* 3726; at Batu Togoh, *Wray* 70904; at alt. 200 ft., *Wray* 2184; at Waterfall, Taiping, *Wray* 4244. MALACCA: *Good-enough* 1496.—DISTRIB. Burma, Tenasserim, Andamans.

Forma *b* C. DC. n. f. limb only slightly cordate or rounded at the base, ♀ spikes generally 2 at the top of a branch, one opposite an undeveloped leaf.

PERAK: Larut at 300—600 ft. altitude, *King's Collector* 1942; at Sungei Ryah, *King's Collector* 900; plains, *Wray* 4243. SELANGOR: Camphor forest, Rawang, *Ridley* 7608. MALACCA: *Maingay* K.D. 1331; *Derry* 80, 82.

Forma *c* C. DC. n. f. Limb subobovate-oblong, cordate or rounded at the base. *Peduncle* 4 mm. long and very slender in the male plant. *Spike*: ♂ about 33 mm. long, 1 mm. thick, rhachis hirtillous; bract glabrous, adnate, free at the margin, oblong, rounded at both ends; stamens 2, anthers obovate: ♀ generally solitary. peduncle and rhachis as in the type; bract minutely ciliate at the

margins. *Berry* glossy, bright when young, red when ripe. *Piper sumatranum*, C. DC. in Prodr. XVI. i. 343; Hook. f. Fl. Br. Ind. V. 81. *Cubeba sumatrana*, Miq. Comm. Phyt. 42, tab. V, fig. A, Syst. Pip. 290, Fl. Ind. Bat. I. ii. 448, Suppl. 8.

PENANG: back of west hills, at 500 ft. altitude, *Curtis* 2256. PERAK: Larut, at 500—1000 ft., a large creeper 40—60 ft. long, *King's Collector* 6618; alt. 2000—2500 ft., *King's Collector* 2901; *Scortechini* 165. SINGAPORE: Reservoir Road, *Ridley* 4825.—DISTRIB. Tenasserim, Andaman Islands, Sumatra.

40. PIPER MUCRONATUM, C. DC. in Records Bot. Surv. Ind. VI. 15 (1912). Creeper; branches glabrous, drying brown, the spiciferous 1 mm. thick. *Leaves* shortly petioled, glabrous; limb coriaceous when dry, up to about 10·5 cm. long and 4·2 mm. wide; oblong-elliptic, acutely and rather long acuminate, the base equilateral, obtuse; 5-plinerved, the central nerve emitting 2 opposite ascendent nerves from 10 mm. above the base and having on each side of it one ascendent nerve free from the base; petiole 6 mm. long, sheath prolonged nearly up to the middle of the petiole. *Peduncle* glabrous, 6 mm. long. *Spike*: ♀ nearly 21 cm. long; rhachis puberulous; bract glabrous, adnate, linear-oblong, obtuse at both ends. *Berry* glabrous, elliptic, 2 mm. long, attenuate at the top into a style, its stipe 1 mm. long.

SUNGEI UJONG: *Ridley* 2126.

41. PIPER LONGIBRACTEUM, C. DC. in Records Bot. Surv. Ind. VI. 16 (1912). Branches glabrous, drying brown, the spiciferous 1·9 mm. thick; collenchyma libriform, in distinct bundles; a single central lysigenous canal. *Leaves* rather long-petioled, glabrous; limb elliptic-lanceolate, acutely acuminate, the base acute and equilateral, 11·5 cm. long, 5—6 cm. wide; 7-plinerved, the central nerve emitting 2 alternate ascendent nerves, the uppermost from 16 mm. above the base, and having on each side of it 2 ascendent nerves free from the base, the external much thinner and shorter than the others; petiole slender, 12—16 mm. long, sheath basal. *Peduncle* glabrous, slender, 16 mm. long. *Spike*: ♀ 10·5 cm. long; rhachis glabrous, 1 mm. thick; bract glabrous, oblong-obovate, attenuate at the base, nearly 2·2 mm. long, sessile above its middle; ovary free, glabrous; stigmas 4, ovate-acuminate. *Berry* stipitate, elliptic, black when dry, 4 mm. long, its stipe a little shorter.

PERAK: Maxwell's hill, *Wray* 101.

42. *PIPER XANTHOCARPUM*, C. DC. in Records Bot. Surv. Ind. VI. 16 (1912). Scandent. Branches glabrous, drying brown, the spiciferous 1 mm. thick; collenchyma continuous, libriform; a single central lysigenous canal; abundant orange-coloured cells in bark and pith. *Leaves* shortly petioled; limb up to 14.5 cm. long and 6 cm. wide; elliptic-lanceolate, acutely acuminate, the base equilateral acute; glabrous above, puberulous underneath; 7—9-plinerved, the central nerves emitting on each side 1—2 ascendent nerves, the uppermost from 26—39 mm. above the base, and having on each side of it 2 ascendent nerves free from the base; petiole glabrous, nearly 6 mm. long, sheath basal. *Peduncle* glabrous, up to 26 mm. long, slender. *Spike*: ♀ up to 12 cm long; rhachis hirsute; bract glabrous, its limb oblong, subattenuate towards the lower end, rounded at the top, adnate, free at the margins, about 3 mm. long and up to 1 mm. wide; ovary free, ovate, glabrous; stigmas 3—4, ovate-acuminate. *Berry* globose, nearly 3 mm. in diam., orange coloured when living, black when dry, longer than its stipe.

PERAK: at 1000 ft. altitude, *Wray* 3795

43. *PIPER LARUTANUM*, C. DC. in Records Bot. Surv. Ind. VI. 16 (1912). Growing on the stems of large trees, 3—5.5 m. long. Branches glabrous, the spiciferous 2 mm. thick; collenchyma libriform, nearly continuous; a central and several peripheric lysigenous canals; abundant fuscous cells in bark and pith. *Leaves* very shortly petioled, glabrous; limb rigid-membranous when dry, copiously pellucid-dotted; 13—16 cm. long, 4.8—7 cm. wide; oblong-elliptic, acutely acuminate, the base inequilateral, rounded on the longest attenuate on the shortest side; penninerved, the central nerve emitting on each side and nearly from its whole length numerous patulo-subascendent nerves; petiole 4.8 mm. long of which 4 mm. between the sides of the limb, sheath basal. *Peduncle* glabrous, 17 mm. long. *Spike*: ♀ 5.6 cm. long, white when living, black when dry; rhachis hirsute; bract adnate, free and minutely ciliate at its margin, 4.5 mm. long, little less than 1 mm. wide, oblong, rounded at both ends; ovary free, glabrous; stigmas 3—4, ovate-acuminate. *Berry* globose, 4 mm. in diam., bright red when living, black when dry, scattered among the flowers.

PERAK: Larut, September, *King's Collector* 3327.

44. *PIPER COLLINUM*, C. DC. in Records Bot. Surv. Ind. VI. 17 (1912). Slender creeper 3.5—4.5 m. long. Branchlets glabrous, the

spiciferous 2 mm. thick; collenchyma continuous, not libriform; a single central lysigenous canal; yellow cells scattered in bark and pith. *Leaves* shortly petioled, glabrous; limb membranous when dry, black-dotted underneath; 13—16 cm. long, 4·8—7 cm. wide; elliptic-lanceolate, acutely acuminate, the base equilateral and acute; penninerved, the central nerve emitting on each side 4 subascendent and thin nerves, the uppermost from 6 cm. above the base; petiole 6 mm. long, sheath prolonged nearly to the middle of the petiole. *Peduncle* 30 mm. long, glabrous. *Spike*: ♀ nearly 8 cm. long; rhachis hirsute; bract glabrous, its limb obovate, subsessile at its centre, 1·5 mm. longer; ovary free, ovate, glabrous; stigmas 3, linear. *Berry* stipitate, ovate acute at the apex, black when dry, 5 mm. long, its stipe shorter.

PERAK: Larut, Goping on limestone hills, at 300–500 ft., April, King's Collector 5906; *Scortechini*.

45. PIPER MURICATUM, Bl. in Verh. Batav. Nat. Genoots. XI. 219, f. 1 (1826) & Enum. Pl. Jav. fasc. I. 68; Miq. Syst. Pip. 326, Ill. Pip. 55, t. 55, in Hook. Lond. Journ. Bot. IV. 438 and Fl. Ind. Bat. I. ii. 2454; C. DC. in Prodr. XVI. i. 341; Hook. f. Fl. Br. Ind. V. 82.—DISTRIB: Java, Sumatra.

*forma peninsulare*, C. DC. n. f. in Records Bot. Surv. Ind. VI. 17 (1912). Herb or shrub up to 3·5 m. high. Branches densely hirsute, the spiciferous 3 mm. thick, hairs nearly 0·7 mm. long; collenchyma nearly wholly libriform in distinct laterally widened bundles or continuous; a central and several peripheric lysigenous canals. *Leaves* moderately long petioled; limb membranous when dry, up to 17 cm. long and 7 cm. wide, pilose on both surfaces, oblong-elliptic, shortly and subacutely acuminate, the base inequilateral and moderately cordate; penninerved, the central nerve emitting on each side 3–4 ascendent nerves, the uppermost from 5·5–7·5 cm. above the base; petiole densely hirsute, up to 10 mm. long of which 2 mm. between the sides of the limb, sheath basal. *Peduncle* densely hirsute, as long as the petiole. *Spike*: ♀ about 4 cm. long; rhachis hirsute; bract glabrous, its limb obovate, 2 mm. long, 1 mm. wide, with a thick pedicel containing gelified cells; ovary free, ovate, globose, subacute at the apex; stigmas 3–5, linear. *Berry* stipitate, ovate-globose, subacute at the apex, glabrous, black when dry, up to 4 mm. long, its stipe 2 mm. long.

PERAK: *Scortechini*; Larut, Waterfall hill, at 500 ft. altitude,

with fruit sealing-wax red, *Ridley* 11025; at 100—2000 ft. altitude with fruit yellowish red, *King's Collector* 1958, 2880; at Jenan *Wray* 1757; SELANGOR: Pahang Track, *Ridley* 8531.

*forma pilistipes*, C. DC. l. c. 18 about 60 cm. high; limb sub-ovate-elliptic acutely acuminate, rounded and slightly inequilateral at the base. *Berry* red when living, its stipe hirtillous.

PERAK: Waterfall hill, in rocky localities, rich soil, *King's Collector* 4869; *Wray* 2076, 4237. SELANGOR: Kwala Lumpur, *Ridley* 4685.

*forma pilosior* Miq. in Linn. xxi, 485; limb elliptic or subovate-elliptic, moderately and acutely acuminate, equilateral and cordate at the base, densely fulvescent-hirsute on both surfaces.

SELANGOR: May, *Ridley* 7610.—DISTRIB. Java, Sumatra.

46. PIPER PROTRACTUM, C. DC. in Records Bot. Surv. Ind. VI. 18 (1912). Diccious or monœcious and then with androgynous spikes. Branches densely hirsute, with hairs 1 mm. long, the spiciferous nearly 6 mm. thick; collenchyma continuous, partly libriform; a central and many peripheric lysigenous canals. *Leaves* shortly petioled; limb, 20·8—33·8 cm. long, 4·2—5·6 cm. wide, pilose on both surfaces especially along the nerves, oblong, subacutely acuminate, the base cordulate and slightly inequilateral; penninerved, the central nerve emitting on each side 4 nerves, the upper ones ascendent and opposite, the lower subascendent and much thinner than the others; petiole hirsute underneath, 10 mm. long of which 6 mm. between the sides of the limb, sheath prolonged above the base. *Peduncle* hirsute, about 12 mm. long. *Spike*: nearly 8·7 cm. long, with male flowers in its upper portion when androgynous, rhachis hirsute; bract glabrous, obovate, more or less attenuate towards its lower end, with a very short and thick pedicel; ovary free, ovate, glabrous; stigmas 3—4 linear. *Berry* globose, acute at the apex, 4 mm. long, its stipe nearly of same length.

JOHORE: Gunong Pulai, Castlewood, *Ridley*. SINGAPORE: Sungei Jurong, *Ridley* 5888; Chan-Chu-Kang, *Ridley* 6723.

47. PIPER BIPEDALE, C. DC. in Records Bot. Surv. Ind. VI. 19 (1912). Erect, 60 cm. high. Branches hirsute, the spiciferous 2 mm. thick; collenchym in distinct and laterally widened bundles, not libriform; a central and many peripheric lysigenous canals. *Leaves* moderately long-petioled; limb membranous when dry, hirsute on the nerves above and on the whole lamina underneath, 20 cm. long and up to 7 cm. wide, obovate-oblong, acutely acuminate; the base



slightly inequilateral, rounded on the longer, attenuate on the shorter side; penninerved; the central nerve emitting on each side 4—5 nerves of which the 2 uppermost ascendent, the others less so and much thinner; petiole densely hirsute, up to 14 mm. long of which 4 mm. between the sides of the limb. *Peduncle* hirsute, 12 mm. long. *Spikes*: ♀ about 32 mm. long, green when flowering; rhachis hirsute; bract glabrous, its limb obovate, 1.5 mm. long, with a central and thick pedicel containing gelified cells; ovary free, glabrous, ovate-acuminate; stigmas 3, linear and acute. *Berry* stipitate, ovate-globose, acute at the apex, black when dry, 4 mm. long, its stipe much shorter.

PERAK: at 300 ft. altitude, *Wray* 3710.

48. PIPER RIDLEYI, C. DC. in Records Bot. Surv. Ind. VI. 19 (1912). Erect, herb or shrub 2—3 ft. high. Branches densely hirsute with hairs nearly 1 mm. long, the spiciferous 4 mm. thick; collenchyma sparingly libriform in distinct bundles; a central and many peripheral lysigenous canals; sclerosed cells in the bark. *Leaves* shortly petioled; limb membranous when dry, nearly 25 cm. long and 12 cm. wide, hirsute on both surfaces; lanceolate-elliptic, acutely acuminate, the base acute and nearly equilateral; penninerved, the central nerve emitting on each side 5 ascendent nerves, the uppermost from about 6.5 cm. above the base; petiole hirsute, up to 10.5 mm. long. *Peduncle* hirsute, up to 1.4 cm. long in the male and up to 2.2 cm. in the female. *Spike*: ♂ nearly 10.5 cm. long and 2 mm. thick; rhachis hirsute; bract glabrous, obovate, subacute at the base with a short thick pedicel containing gelified cells; stamens 2, anthers rounded: ♀ a little shorter than in the male; rhachis hirsute; bract glabrous, obovate, up to 2 mm. long and 1.5 mm. wide with pedicel as in the male; ovary free, glabrous; stigmas 4, linear, acute. *Berry* globose, glabrous, shorter than its puberulous stipe.

PERAK: Maxwell's hill, *Curtis* 2047; Waterloo, *Curtis* 2697!; rich soil, rocky locality, at 1000-1500 ft. altitude, August, *King's Collector* 10784; Gunong Batu Putih, lower camp, alt. 3400 ft., *Wray* 428. SELANGOR: Ginting Peras, May, *Ridley* 7690; 15th mile along Pahang track, *Ridley* 8519;

*forma b*, branches with a continuous and nearly quite libriform collenchyma; spikes androgynous, the inferior flowers bisexual, the superior male.

PERAK: dense bamboo forest, at 500—700 ft. altitude, near Ulu

Kerling, flower light yellow, fruit sealing-wax red, *King's Collector* 8810.

49. *PIPER NIGRANTHERUM*, C. DC. in *Records Bot. Surv. Ind.* 20 (1912). Branches glabrous, the spiciferous 2 mm. thick; collenchyma not libriform, in distinct thick and laterally much widened bundles or even subcontinuous; no peripheric lysigenous canals; dark-reddish cells abundant in bark and pith. *Leaves* moderately long-petioled, glabrous; limb rigid-membranous when dry, minutely pellucid-dotted, up to 16.5 cm. long and 9 cm. wide; ovate, acutely acuminate, the base inequilateral, cordate, both sides inserted at the same level, one wider and longer than the other; 8-plinerved, the central nerve emitting on both sides 2 ascendent nerves the uppermost from 16 mm. above the base, and having on one side of it 3 on the other 2 nerves free from the base, the inner subascendent the outer more arcuate and much shorter; petiole nearly 15 mm. long, with sheath prolonged up to its middle. *Peduncle* as long as the petiole. *Spike*: ♂ about 9 cm. long and 3.5 mm. thick; rhachis hirsute; bract glabrous, its limb obovate, attenuate at the lower end, with a central clavate pedicel; stamens 2, anthers ovate, shorter than the filaments, dark black when dry.

SINGAPORE: in the Botanic Garden, and probably also spontaneous, *Ridley*.

50. *PIPER FILIPES*, C. DC. in *Records Bot. Surv. Ind.* 20 (1912). Creeping. Stalk and branches very slender, glabrous, the spiciferous branches up to 1 mm. thick; collenchyma libriform, in distinct bundles; a single central lysigenous canal; a zone of sclerosed cells between the phloem masses of the peripheric fibro-vascular bundles. *Leaves* shortly petioled, glabrous; limb membranous when dry, minutely reddish-pellucid-dotted, about 9 cm. long, 4 cm. wide; oblong-ovate, acutely attenuate, the base rounded, both sides of same length but slightly unequally wide; 5-plinerved, the central nerve emitting 2 opposite or subopposite ascendent nerves from about 6 mm. above the base, and having on each side of it one ascendent nerve free from the base; petiole very thin, with a sheath prolonged a little above its base. *Peduncle* filiform, glabrous, nearly 28 mm. long. *Spike*: ♂ 16 mm. long and nearly 1 mm. thick when flowering, white when living; rhachis hirsute; bract glabrous, its limb rounded, 0.5 mm. in diam. with a short central pedicel; stamens 3, very short, anthers rounded, 4-valvate.

PERAK : at Larut at 3200—500 ft. in open jungle on rich rocky soil, *King's Collector* 3122.

51. *PIPER RUFIBRACTEUM*, C. DC. in Records Bot. Surv. Ind. VI. 21 (1912). Branches glabrous drying brown, the spiciferous 1 mm. thick ; collenchyma subcontinuous and nearly libriform ; no lysigenous canal. *Leaves* very shortly petioled, glabrous ; limb subcoriaceous when dry, copiously pellucid-dotted ; up to 9.5 cm. long and 3.5 cm. wide ; oblong-elliptic, shortly and obtusely attenuate, the base inequilateral, rounded on both sides ; 9-plinerved, the central nerve emitting 2 alternate ascendent nerves the uppermost from nearly 29 mm. above the base, and having on each side of it 3 nerves free from the base the most external more arcuate much thinner and shorter than the others ; petiole 5.5 mm. long of which 3 mm. between the sides of the limb, sheath prolonged a little above the base. *Peduncle* glabrous 4.2 mm. long. *Spike* : ♂ 25.5 mm. long and 1 mm. thick when nearly flowering ; rhachis glabrous ; limb of bract obovate, subattenuate at its lower end, densely rufo-pubescent outside, with a glabrous short and thick pedicel containing gelified cells ; stamens 2 or ? 3, anthers ovate, 4-valvate, shorter than the oblong filaments.

MALACCA : *Maingay* K. D. 1329.

52. *PIPER KUNSTLERI*, C. DC. in Records Bot. Surv. Ind. VI. 21 (1912). Erect, 60—90 cm. high. Branches glabrous, drying brown, the spiciferous 0.5 mm. thick ; collenchyma continuous, sparingly libriform ; a single central lysigenous canal. *Leaves* glabrous, very shortly petioled ; limb membranous when dry, minutely pellucid-dotted, 12.5 cm. long, 4.5 cm. wide ; elliptic-oblong, acutely and rather long acuminate, the base slightly inequilateral, attenuate on the shortest sides rounded on the longest ; penninerved, the central nerve emitting on each side 3 ascendent thin nerves, the uppermost from 25—30 mm. above the base ; petiole about 2 mm. long with basal sheath. *Peduncle* glabrous, very slender, 6 mm. long. *Spike* : ♂ nearly 21 mm. long and 2 mm. thick when flowering, rhachis hirsute ; limb of the bract orbicular, glabrous, 0.6 mm. in diam., with a short hirsute and central pedicel ; stamens 3, anthers ovate, 4-valvate, much shorter than the rather long filaments.

PENANG : in dense jungle on rocky ground, February, *King's Collector* 1315.

53. *PIPER CURTIPETIOLUM*, C. DC. in Records Bot. Surv. Ind. 22 (1912). Branches glabrous, reddish-brown when dry, the spiciferous nearly 1 mm. thick; collenchyma in distinct and laterally widened bundles, not libriform; no peripheric lysigenous canals. *Leaves* shortly petioled, glabrous; limb membranous when dry, minutely pellucid-dotted, 8.5 cm. long, 26 mm. wide; elliptic-lanceolate, acutely acuminate, the base equilateral and acute; 5-plinerved, the central nerve emitting 2 ascendent alternate nerves, the uppermost from about 17 mm. above the base, and having on each side of it one ascendent nerve free from the base; petiole 5 mm. long, sheath basal. *Peduncle* glabrous, very slender, nearly 5 mm. long. *Spike*: ♂ about 17 mm. long and 1.5 mm. thick; rhachis hirsute; bract glabrous, its limb rounded, nearly 1 mm. in diam., subsessile at its centre; stamens 3, unequally long, anthers ovate, much shorter than the oblong filaments when these are fully developed.

PERAK: *Scortechini*; Gunong Inas, *Wray* 4145.

54. *PIPER ERECTICAULE*, C. DC. in Records Bot. Surv. Ind. 22 (1912). Erect. Branches glabrous, the spiciferous about 1 mm. thick; collenchyma libriform, continuous, rather thick; a single central lysigenous canal. *Leaves* shortly petioled, glabrous; limb membranous, black-dotted underneath when dry, up to 15 cm. long and 4 cm. wide; elliptic-oblong, acutely acuminate, the base nearly equilateral and acute very slightly wider on one side; 8-plinerved, the central nerve emitting 5 ascendent nerves of which 2 on one side 3 on the other side, the uppermost from 3 cm. above the base, and having on each side of it one ascendent nerve much shorter than the others; petiole up to 5 mm. long, sheath basal. *Peduncle* glabrous, 7 mm. long. *Spike*: ♂ 13 mm. long when flowering; rhachis hirsute; bract glabrous, its limb rounded, 1 mm. in diam., shortly pedicellate near its centre; stamens 3, anthers ovate.

KEDAH: woods on Kedah Peak, an erect pepper, June, *Ridley*.

55. *PIPER EUCALYPTOLIMBUM*, C. DC. in Records Bot. Surv. Ind. 23 (1912). Scandent, 4.5–6 m. long. Branches glabrous, dark brown when dry, the spiciferous 9.5 mm. thick; collenchyma in distinct bundles and partly libriform; a single central lysigenous canal. *Leaves* shortly petioled, glabrous; limb membranous when dry, minutely reddish-pellucid-dotted, about 14.5 cm. long, 4 cm. wide; elliptic-lanceolate, acutely acuminate, the base acute distinctly nar-

rower on one side, equally long on both sides; 7-plinerved, the central nerve emitting on each side 2 ascendent thin nerves, the uppermost from 5.7 cm. above the base, and having on each side of it one ascendent nerve free from the base; petiole 6.3 mm. long, with basal sheath. *Peduncle* glabrous, 8.5 mm. long, very slender. *Spike*: ♂ 6.5 cm. long and 2 mm. thick when nearly flowering; rhachis hirsute; bract glabrous, its limb subovate-elliptic, 1.5 mm. long, with a very short and thick pedicel containing gelified cells; stamens 2, anthers elliptic, 2-valvate.

PERAK: at Larut, 2800—3000 ft. alt., *King's Collector* 3228.

56. PIPER SUBRUBRISPICUM, C. DC. in Records Bot. Surv. Ind. VI. 23 (1912). About 90 cm. high. Branches rather long-hirsute, the spiciferous 3 mm. thick; collenchyma continuous, not libriform; a single central lysigenous canal. *Leaves* long-petioled; limb membranous when dry, copiously pellucid-dotted, glabrous above, hirsute underneath, up to 15 cm. long and 14 cm. wide; rounded-ovate, obtusely acuminate, the base equilateral, deeply cordate; 9-plinerved, the central nerve emitting 2 opposite ascendent nerves from 4.2 mm. above the base and having on each side of it 3 nerves free from the base; petiole about 6 cm. long, hirsute on the back, the sheath prolonged up to nearly 14.5 mm. above the base, the stipules densely pubescent outside. *Peduncle* hirsute, 6.3 mm. long. *Spike*: ♂ about 6 cm. long and 4.2 mm. thick when flowering, obtuse at the top, white and tinted dull-pink when living, blackish red when dry; rhachis glabrous; bract glabrous, its limb oblong-obovate, attenuate towards the lower end, with a short central pedicel; stamens 3, anthers reniform, 4-valvate, shorter than the oblong filaments.

PERAK: upper land, *Wray* 3579.

57. PIPER LONGAMENTUM, C. DC. in Records Bot. Surv. Ind. VI. 23 (1912). Scandent? Branches hirsute, drying brown, the spiciferous nearly 1 mm. thick, hirtillous; collenchyma in distinct laterally widened bundles, its inner zone libriform; a single central lysigenous canal. *Leaves* shortly petioled; limb membranous when dry, minutely pellucid-dotted, up to 10.5 cm. long and 3.5 cm. wide, oblong-ovate-lanceolate, acutely and rather long acuminate, equilateral and acute at the base, sparingly pubescent above and rather densely underneath; 5-plinerved, the central nerve emitting 2 opposite ascendent nerves from about 14.7 mm. above the base and having on each side

of it one ascendent nerve free from the base; petiole 6.3 mm. long, densely hirtillous. *Peduncle* nearly glabrous, 8.4 mm. long, slender. *Spike*: ♂ nearly 14 cm. long, 1.5 mm. thick; rhachis hirsute; bract glabrous, its limb rounded, nearly 1 mm. in diam.; stamens 2, anthers ovate, 4-valvate, nearly as long as the oblong filaments.

PERAK: at Larut, 1800—3000 ft., August, *King's Collector* 32071.

58. *PIPER SUBSESSILILIBUM*, C. DC. in Records Bot. Surv. Ind. VI. 24 (1902). Scandent, cirrhi ramulose. Branches glabrous, drying brown, the spiciferous nearly 1 mm. thick; collenchyma libriform, in distinct laterally much widened bundles; a central and many peripheral lysigenous canals; very abundant dark brown cells in bark and pith. *Leaves* subsessile, glabrous; limb membranous when dry, minutely pellucid-dotted, up to 19 cm. long and 5 cm. wide, subobovate-elliptic-oblong, acutely and moderately long acuminate, the base attenuate, shorter on one side; penninerved, the central nerve emitting on each side from nearly all its length about 20 thin subspreading nerves; petiole 3 mm. long of which 1 mm. between the sides of the limb, sheath basal. *Peduncle* glabrous, 8.4 mm. long. *Spike*: ♂ still juvenile, nearly 6 cm. long, up to 2 mm. thick, yellow when living; rhachis hirtillous; bract glabrous, its limb longitudinally elliptic with a short central pedicel.

PERAK: near Goping in dense jungle, August, *King's Collector* 578.

59. *PIPER OBOVANTHERUM*, C. DC. in Records Bot. Surv. Ind. VI. 24 (1912). Branches glabrous, dark brown when dry, the spiciferous 1 mm. thick, in branches 2 mm. thick; collenchyma libriform, in distinct bundles; a single central lysigenous canal. *Leaves* moderately long-petioled, glabrous; limb membranous when dry, elliptic, up to 14 cm. long and 9 cm. wide; elliptic, acutely acuminate, the base subrounded slightly longer on one side; 7-plinerved, the central nerve emitting 2 ascendent nerves, the uppermost from nearly 12 mm. above the base, and having on each side of it 2 ascendent nerves free from the base; petiole 12 mm. long of which 2 mm. between the sides of the limb, sheath basal. *Peduncle* glabrous, nearly 19 mm. long, very slender. *Spike*: ♂ about 52 mm. long and nearly 1 mm. thick when flowering; rhachis hirtillous; bract adnate, obovate-oblong, subattenuate at the lower end, obtuse at the apex, minutely ciliate at the margins otherwise glabrous, 2.5 mm. long, up to 1 mm.

wide; stamens 3, anthers obovate, 4-valvate, a little longer than the oblong filaments.

PERAK: Government hill, March, *Ridley* 2732.

Perhaps the ♂ of *P. Zuccarini*, C. DC. in Prodr. XVI. 1, 365.

60. PIPER ARGYRITES, Ridl. MSS. ex C. DC. in Records Bot. Surv. Ind. VI. 25 (1912). Branches glabrous, drying brown, the spiciferous up to 1.5 mm. thick; collenchyma continuous, sparsely libriform; a single central lysigenous canal. *Leaves* moderately petioled, glabrous; limb firm when dry, minutely pellucid-dotted, up to 18 cm. long and to 6 cm. wide; oblong-ovate, acutely acuminate, the base rounded and slightly inequilateral; 7-plinerved, the central nerve emitting 2 ascendent nerves, the uppermost from 15 mm. above the base and having on each side of it 2 nerves free from the base, the internal ascendent the external subascendent much thinner and shorter than the others; petiole 10 mm. long, 2 mm. of which between the sides of the limb, sheath prolonged up to the middle of the petiole. *Peduncle* glabrous, 25 mm. long. *Spike*: ♂ 8 cm. long and 3 mm. thick when nearly flowering; rhachis hirsute; bract glabrous, obovate, adnate to the rhachis, up to 1.5 mm. long; stamens 2, anthers reniform, 4-valvate, filaments of same width as the anthers.

SELANGOR: Gua Batu, December, *Ridley* 8176; Ginting Bidai, May, *Ridley* 7611.

61. PIPER CLYPEATUM, Wall. Cat. 6655 A and B (1828). Stem creeping, rooting from the nodes; collenchyma continuous, mainly libriform, a single row of intramedullar bundles; a single central lysigenous canal. *Leaves* very shortly petioled; limb rigid-membranous when dry, pellucid-dotted, glabrous above, pubescent underneath, round or ovate-rounded cordate at the base, 11.5—15 cm. diam. *Spikes* unknown. C. DC. in Prodr. XVI. i. 378; Hook. f. Fl. Br. Ind. V. 96 and 537. *P. obtusissimum* Miq. Syst. Pip. 337. *P. manillanum*, Miq. l. c. 339.

PENANG, SINGAPORE: *Wallich*.—DISTRIB. Assam, Manilla.

SECT. II.—MULDERA, Hook. f. Fl. Br. Ind. V. 79, *emend.*

(Sect. SCHIZONEPHROS, C. DC. in Prodr. XVI. 1. 24).

Spikes oppositifolious. Bracts adnate to the rhachis except at their lower and upper ends where they are connate into a receptacle containing stamens or ovaries. Flowers unisexual. Stamens 2—10

in a single or in a double transverse row. Ovary free, solitary or 2—4 free ovaries in a transverse row.

- 1°. Receptacle glabrous outside, pubescent inside:  
 Male and female receptacles sessile, much condensed, elliptic, bilabiate, the female receptacle containing a single ovary .. 62. *P. pentandrum*.  
 Male receptacle sessile, distant, elliptic, bilabiate .. .. 63. *P. flavimarginatum*.  
 Female receptacle subsessile, rounded, containing a single ovary .. .. 64. *P. firmum*.
- 2°. Receptacle pubescent, outside and inside:  
 Male receptacle stipitate, rounded, 3—5-androus .. .. 65. *P. Maingayi*.  
 Male receptacle elliptic, bilabiate, 2-androus .. .. 66. *P. rarispicum*.  
 Male receptacle reniform, bilabiate, 8-androus .. .. 67. *P. Schizonephros*.  
 Female receptacle sessile, elliptic, bilabiate, containing 3—4 ovaries .. 68. *P. polygamum*.
- 3°. Species insufficiently known .. .. 69. *P. pachyphyllum*.

62. PIPER PENTANDRUM, C. DC. in Records Bot. Surv. Ind. VI. 25 (1912). Scandent. Branches glabrous, dark brown when dry, the spiciferous 2 mm. thick; collenchyma libriform in distinct laterally widened bundles; a single central lysigenous canal or none; a circle of sclerous cells tightly surrounding the peripheric fibro-vascular bundle. *Leaves* glabrous, moderately long-petioled; limb coriaceous, the upper ones 9—12.5 cm. long, 3.5—5 cm. wide, the lower up to 12.5 cm. long and 7.5 cm. wide; elliptic-lanceolate, acutely acuminate, the base equilateral, acute; 7-plinerved, the central nerve emitting 2 opposite or alternate nerves the uppermost from 10.5—12.5 mm. above the base, and having on each side of it 2 ascendent nerves free from the base; petiole about 10.5 mm. long, sheath basal. *Peduncles* glabrous, as long as the petiole. *Spike*: ♂ about 27 mm. long and 3 mm. thick, densely floriferous; rhachis glandular-asperulate when young, later glabrous; receptacles sessile, much condensed, elliptic, bilabiate, glabrous outside, hairy inside, woody; stamens 5, rarely 6, anthers ovate, 4-valvate, shorter than the oblong filaments: ♀ about 27 mm. long and 4 mm. thick; ovary free, glabrous, ovate; stigmas 3, elliptic-acute. *Berry* globose, 5 mm. in diam.

PERAK: upper land, at 300 ft., Wray 3655; *Scortechini* 114.

Var. *β. magnifolium* C. DC. l. c. Branches thicker; collenchyma libriform, continuous or nearly so; many peripherous lysigenous canals; no sclerose cells round the peripheric fibro-vascular bundles;



limb elliptic, 12 cm. long 7.5—10 c.m. wide; petiole, peduncle and female spike nearly 26 mm. long.

PERAK : *Scortechini* 779.

63. PIPER FLAVIMARGINATUM, C. DC. in Records Bot. Surv. Ind. 26 (1912). Branches glabrous, drying brown, the spiciferous 2 mm. thick; collenchyma libriform, continuous; a central and several peripheric lysigenous canals; in branches 4 mm. thick there is a continuous zone of sclerosed cells tightly surrounding the peripheric fibro-vascular bundles. *Leaves* moderately petioled, glabrous; limb elliptic, acutely acuminate, acute and inequilateral at the base, nearly 12 cm. long and 8 cm. wide; 7-plinerved, the central nerve emitting on each side 2 ascendent nerves, the uppermost from about 23 mm. above the base, and having on each side of it one ascendent nerve free from the base; petiole 14.8 mm. long with 6.3 mm. between the sides of the limb, sheath basal. *Peduncle* glabrous nearly 26 mm. long. *Spike*: ♂ 6.3 cm. long; rhachis glabrous receptacles subsessile, loose, elliptic, bilabiate, glabrous outside hirsute inside; stamens 8, in a single row, anthers ovate, 4-valvate, shorter than the oblong filaments.

SINGAPORE: at Chan-Chu-Kang, *Ridley* 3772?; at Bukit Timah, *Ridley* 6425.

64. PIPER FIRMUM, C. DC. in Prodr. XVI. 1. 242. Scandent. Branches glabrous, reddish-fuscescent when dry, the spiciferous about 2 mm. thick; collenchyma libriform, in distinct bundles; a central and many peripheric lysigenous canals; sclerosed cells surrounding the masses of phloem of the peripheric fibro-vascular bundles. *Leaves* moderately petioled, glabrous; limb coriaceous, about 7.9 cm. long and 3 cm. wide, elliptic-lanceolate, acute at the top, the base acute, equilateral or slightly inequilateral; 5—6-plinerved, the central nerve emitting 2—3 ascendent nerves, the uppermost from near the base and having on each side of it one ascendent nerve free from the base; petiole 8.5 mm. long with basal sheath. *Peduncle* glabrous, 12.5 mm. long. *Spike*: ♀ nearly 4 cm. long; rhachis glabrous; receptacle sessile, rounded, flattened when adult, glabrous outside, hirsute with adpressed hairs inside. *Berry* globose, glabrous, 5 mm. in diam., brown when dry. *Muldera firma*, Miq. in Ann. Mus. Bot. Lugd.-Bat. V. 140.

PERAK: Tapa, *Wray* 1281.—DISTRIB: Java, Herb. Bogor, *Kurz* 1290; Sumatra, *Korthals*.

Differs from *Korthals'* specimen only by the presence of peripheric lysigenous canals.

65. PIPER MAINGAYI, Hook. f. Fl. Br. Ind. V. 80 (1885). Branches glabrous, fuscous when dry, the spiciferous 1.5 mm. thick; collenchyma libriform in distinct bundles; several peripheric lysigenous canals; a continuous zone of sclerosed cells tightly surrounding the peripheric fibro-vascular bundles. *Leaves* moderately long-petioled, glabrous; limb thickly coriaceous, 10.5—13 cm. long, 5.3—6.5 cm. wide, elliptic-lanceolate, the base equilateral; 5-plinerved, the central nerve emitting 2 ascendent nerves, the uppermost from 3.9—5.5 cm. above the base, and having on each side of it one ascendent nerve free from the base; petiole up to 8.5 mm. long, sheath basal. *Peduncle* a little longer than the petiole, finely tomentose as are the rhachis and receptacles. *Spike*: ♂ nearly 42 mm. long, densely velutino-puberulous; the receptacles stipitate, loose, rounded, 1.5 mm. in diam., densely velutino-puberulous outside and inside, 3—5-androus; anthers ovate, 4-valvate, shorter than the filaments: ♀ 5.3 cm. long; receptacles sessile, rounded, densely velutino-puberulous outside and inside. *Berry* globose, about 6 mm. in diam.

SINGAPORE AND MALACCA: *Maingay* K.D. 1334, 1336.

The leaves are like those of *P. firmum*, but the spikes, by their pubescence, are very different from those of that species.

66. PIPER RARISPICUM, C. DC. in Records Bot. Surv. Ind. VI. 27 (1912). Branches glabrous, blackish when dry, the spiciferous 1 mm. thick; collenchyma continuous, libriform; a central and many peripheric lysigenous canals. *Leaves* moderately long-petioled, glabrous; limb 10.5—13 cm. long, 5.8—7 cm. wide; ovate, acutely and rather shortly acuminate, the base rounded and slightly inequilateral; 7-plinerved, the central nerve emitting 2 ascendent nerves the uppermost from 14.5—16.5 mm. above the base, and having on each side of it 2 nerves free from the base, the inner ascendent the outer subascendent, much shorter and thinner than the others; petiole 14.5—19 mm. long. *Peduncle* slender, glabrous, 29 mm. long. *Spike*: ♂ rarely seen, 5.9 cm. long; rhachis puberulous; receptacles stipitate, elliptic, velutino-pubescent outside and inside, diandrous; anthers obovate, 4-valvate, about 0.5 mm. long, the oblong filament of same length.

PENANG: road to Sungei Penang, at 1500 ft., *Curtis* 1771.

67. *PIPER SCHIZONEPHROS*, C. DC. in Prodr. XVI. 1. 241 *exclud.* spec. Jungh. Branches glabrous, dark brown when dry, the spiciferous nearly 1 mm. thick; collenchyma libriform, in distinct bundles, a central and several peripheric lysigenous canals; a thick circle of sclerosed cells tightly surrounding the peripheric fibro-vascular bundles. *Leaves* glabrous; limb coriaceous, 8—13 cm. long, 2.6—5 cm. wide; elliptic-lanceolate, acute at both ends, the base equilateral; 5-plinerved, the central nerve emitting 2 ascendent alternate nerves the uppermost from about 26 mm. above the base and having on each side of it one ascendent nerve free from the base; petiole about 8.5 mm. long, sheath basal. *Peduncle* glabrous, nearly 18 mm. long, slender. *Spike*: ♂ 15.5—18.5 cm. long; rhachis very slender, hairy; receptacles stipitate, reniform; about 8-androus, filaments short, anthers small, rounded, 4-valvate, shorter than the filaments. Hook f. Fl. Br. Ind. V. 79. *Schizonephros glaucescens*, Griff. Notul. IV. 363.

PENANG: Government hill, *Curtis* 1771. MALACCA: at Ching, *Griffith* 4400.

68. *PIPER POLYGYNUM*, C. DC. in Records Bot. Surv. Ind. VI. 27 (1912). Large climber, stem up to 13 cm. thick. Branches glabrous, drying brown, the spiciferous 7 mm. thick; collenchyma in these 3 mm. thick libriform in distinct bundles, no lysigenous canal; a circle of sclerose cells tightly surrounding the peripheric fibro-vascular bundles. *Leaves* moderately long-petioled, glabrous; limb coriaceous when dry, elliptic, shortly and acutely acuminate, the base attenuate and slightly inequilateral; about 13 cm. long and 6.5 cm. wide; penninerved, the central nerve emitting on each side 3 alternate and ascendent nerves, the uppermost from 29 mm. above the base; petiole 14.5 mm. long of which 2 mm. between the sides of the limb, sheath basal. *Peduncle* glabrous, 29 mm. long, slender. *Spike*: ♀ nearly as long as the limb, rhachis minutely puberulous; receptacles rather distant, sessile, transversely elliptic, minutely velutinous outside, densely hirsute inside, containing 3—4 ovaries of which only one maturing; ovaries free, sessile, ovate, velutinous at the top; stigmas 3, linear. *Berry* glabrous, globose, nearly 5 mm. in diam.

PERAK, at 3500 ft., *Wray* 4068. SUNGAI UJONG: *Stephenson*.

69. *PIPER PACHYPHYLLUM*, Hook. f. Fl. Br. Ind. V. 80 (1888). Glabrous. *Leaves* moderately long-petioled; limb probably fleshy when living, thickly coriaceous and pale yellowish when dry; elliptic,

acute or acuminate, 10.5—15 cm. long, 5.5—10.5 cm. wide; 5—7-plinerved, the central nerve emitting 2 nerves and having on each side 1—2 nerves free from the base; petiole 6.3—12.6 mm. long. *Peduncle* much longer than the petiole, very stout; rhachis glabrous; bracts forming a ring round the base of the smooth globose berry (*ex* Hook. f. l.c.).

MALACCA: *Griffith*.

SECT. III.—HECKERIA, Hook f. Fl. Br. Ind. V. 195.

(Sect. POTOMORPHE C. DC. in Prodr. XVI. i. 133).

Spikes axillary or condensed at the top of an axillary branchlet. Bract hypopeltate. Flower bisexual. Stamens 2-3. Ovary free, stigmas 3.

70. PIPER UMBELLATUM, Linn. Sp. Pl. 43, var. *subpeltatum* C. DC. in Donn.-Sm. Enum. VI. 339. Shrub 0.9—2 m. high. Stem and branches glabrous, the spiciferous minutely glandulose, about 7 mm. thick; collenchyma not libriform, in distinct and laterally much widened bundles; 2 rows of intramedullar bundles, a single lysigenous canal. *Leaves* very long petioled; limb membranous when dry, copiously reddish-pellucid-dotted, velutino-puberulous on both surfaces; about 16—18 cm. long and up to 30 cm. wide, rounded-reniform, acutely and very shortly acuminate, the base equilateral, deeply cordate, 17-plinerved, the central nerve emitting 2 pairs of ascendent nerves, the uppermost from up to 26 mm. above the base, and having on each side of it 6 nerves diverging from the base; petiole velutino-puberulous on the back, 24—30 cm. long, sheath prolonged up to the middle of the petiole. Spiciferous branch 3—4 cm. long, minutely puberulous, bearing 5—7 peduncles about 12 cm. long in the axils of oblong-acuminate and early deciduous scales. *Spikes* up to 8 cm. long and 3 mm. thick; rhachis glabrous; limb of bract triangular, ciliate at the margin, with a central glabrous pedicel; stamens 2 on the extreme base of the ovary; anthers deciduous, very small, nearly reniform, 4-valvate. *Berry* obovate, trigonous, about 0.75 mm. long, glabrous; stigmas 3, linear, sessile, very short. *P. subpeltatum*, Willd. Sp. Pl. I. 166; C. DC. in Prodr. l.c. 333; Hook f. Fl. Br. Ind. V. 95. *Heckeria subpeltata*, Kth. in Linn. XIII. 571. *Potomorphe subpeltata*, Miq. Syst. Pip., 213, Illustr. 29, tab. 26, in Linn. XX. 129, Pl. Jungh, l. 116, Fl. Ind. Bat. I. ii. 437 and Suppl. 186; in Linn. XXI. 481; Wight Ic. t. 1925.

PENANG: *Wallich* 6638. PERAK: Kuala Weh, *Wray* 348; Larut, *King* 1890; Waterloo, *Curtis* 2698; *Scortechini*; *Wray* 2467. SELANGOR: Bidai, *Ridley* 7612.—DISTRIB. India (Deccan Peninsula from the Concan hills at 5000 ft. altitude southwards, Nilgiris), Ceylon, Malay Archipelago, Philippine Islands, Tropical America, West Indies, Tropical Africa.

SECT. IV.—ENCKEA, C. DC. in Prodr. XVI. i. 234, *emend.*

Spikes oppositifolious. Bract squamiform, more or less cucullate. Flower bisexual. Stamens 5—6, rarely 4. Ovary free, stigmas 3—5.

71. PIPER LAPPACEUM, C. DC. in Flor. Ind.-Chin. V. 68. Root fibrous, stem erect, 30—35 cm. high, glabrous; collenchyma continuous, not libriform; no lysigenous canal. *Leaves* moderately long petioled, glabrous; limb membranous when dry, pellucid-dotted; 10 cm. long, 6 cm. wide; ovate, acutely acuminate, the base inequilateral, cordate; 5—7-nerved, the 3 central nerves stouter than the others; petiole about 17 mm. long, of which 2 mm. between the sides of the limb, sheath more or less prolonged above the base, stipules attenuate and decurrent at the top. *Peduncle* glabrous, nearly 70 mm. long. *Spike* 60 mm. long; rhachis slender, minutely glandulose; flowers distant, pedicellate; bract ovate, 1 mm. long; pedicel of the flower 3 mm. long; stamens 6, filaments very short, anthers oblong; ovary rounded, covered with glochidiate processes; style terminal, carnosose, glabrous; stigmas 4, ovate-linear. *Berry* globose, 3 mm. in diam, bristling with glochids, these about 3 mm. long. *P. Zippelia*, C. DC. in Prodr. XVI. i. 256. *Zippelia begoniæ-folia*, Bl. in Roem. Schult. Syst. VII, 1614, 1651; Miq. Syst. Pip. 258, Illustr., 58, tab. 92 f.c. *Zippelia lappacea*, Benn. Pl. Jav. Rar. 76, tab. 16.

PERAK: at Kwala Dipang, *Ridley* 9584; Ulu Batang Padang, *Ridley* 13786.—DISTRIB.: Tonkin, Java, Sumatra.

#### Family CIV. PROTEACEÆ.

Trees or shrubs, rarely herbs. *Leaves* usually coriaceous; alternate or scattered, rarely opposite or verticillate; entire, toothed or pinnatisect; stipules none. *Flowers* capitate, spicate, racemose or rarely solitary; hermaphrodite or by abortion polygamous or dioecious, regular or irregular; bracts small, caducous or nearly obsolete.

sometimes imbricate, persistent and hardened in fruit, forming a cone; bracteoles 0—2. *Perianth* inferior, segments 4, at first valvately connate in a tube with gibbous base at length more or less separating with free recurved tips. *Stamens* 4, inserted on or opposite to the perianth-segments; anthers erect, the connective continuous with the filaments; cells 2, introrse, dehiscence longitudinal. *Disk* consisting of 4 hypogynous scales, free or connate, alternating with the filaments, sometimes 0. *Ovary* superior, sessile or stipitate, 1-celled, often oblique; style terminal, the tip thickened; stigma terminal or lateral; ovules solitary or in pairs or many, biseriate. *Fruit* a nut or drupe, indehiscent or ultimately opening on the inner edge or at the tip, or a follicle or capsule with often thickly coriaceous valves. *Seeds* solitary or in pairs or few; testa membranous or coriaceous, sometimes winged; albumen 0; cotyledons compressed or fleshy, often unequal; radicle short, inferior or lateral. **DISTRIB.** Genera about 50, species very many, chiefly Australian or South African, a few only in tropical Asia, Africa and America, none in Europe, N. Asia or N. America.

#### 1. HELICIA, Lour.

Trees or large shrubs. *Leaves* alternate, entire, toothed or rarely pinnatisect. *Flowers* in terminal and axillary racemes, hermaphrodite, regular, pedicelled, usually in pairs; bracts small, caducous; bracteoles minute. *Perianth*—tube slender, limb narrow, ovate or oblong, straight, segments revolute when in flower. *Stamens* 4, anthers oblong, connective produced in an apiculus. *Hypogynous scales* free or connate in a cup-shaped disk. *Ovary* sessile; style slender; stigma terminal; ovules 2, basal or lateral, attached below the middle. *Fruit* a subglobose hard nut. *Seeds* 1—2, subglobose or hemispheric; testa rugose or veined; cotyledons fleshy. **DISTRIB.** Tropical Asia and Australia.

Racemes glabrous; hypogynous scales connate or completely forming a cup; bracts and bracteoles minute.

*Leaves* petioled.

Petiole up to 1 cm. long; leaves subcoriaceous, entire or distantly serrated in the upper half; perianth moderately slender, thick

.. 1. *H. attenuata*.

Petiole 2—3 cm. long; leaves firmly coriaceous, entire; perianth stout, very thick

.. 2. *H. petiolaris*.

*Leaves* sessile or nearly so, the margins of the blade decurrent quite to the base.

Leaves entire; hypogynous scales in a cup;  
perianth thick .. .. . 3. *H. Kingiana*.

Leaves coarsely serrate in the upper half; perianth  
thin .. .. . 4. *H. robusta*.

Racemes pubescent, tomentose or villous; hypogynous  
scales free.

Racemes densely rufous-pubescent or velvety; leaves  
entire or nearly so.

Leaves rufous-pubescent beneath, petioles 3—4  
cm. long; racemes 15—20 cm. long; bract and  
bracteoles ovate, minute .. .. . 5. *H. rufescens*.

Leaves plumbeous beneath, nearly glabrous,  
petioles 1—1.5 cm. long; racemes dense, short;  
bract and bracteoles linear, conspicuous .. 6. *H. velutina*.

Leaves glabrous, yellowish when dry, petiole 1—2  
cm. long; racemes slender, 5—10 cm. long;  
bract and bracteoles acuminate, short .. 7. *H. excelsa*.

Leaves glabrous, nearly black when dry, petiole  
about 1 cm. long; racemes slender, short; bract  
and bracteoles rather short .. .. . 8. *H. Scortechinii*.

Racemes glabrescent; bracts and bracteoles short.

Racemes 10—15 cm. long; leaves yellowish when  
dry, entire; leaf petiole over 1 cm. long .. 7. *H. excelsa*.

vars. *salicifolia*  
and *Forbesii*.

Racemes 15—20 cm. long; leaves prominently  
serrate, olive-brown when dry, under-surface  
yellowish; leaf petiole under 1 cm. long .. 9. *H. Curtisii*.

1. *HELICIA ATTENUATA*, Bl. in Ann. Sc. Nat. Ser. 2. 1. 216  
(1834). A large shrub or low tree reaching a height of 6—9 m. with a  
diam. of up to 30—40 cm.; branches spreading; branchlets pale brown,  
moderate-sized, smooth; all parts quite glabrous. *Leaves* subcoriaceous;  
obovate or oblanceolate, acute or acuminate at apex, long attenuate at base;  
olive-green or reddish when dry, the upper surface slightly shining and somewhat  
bullate; margins entire or with a few distant serratures in the upper half;  
12—30 cm. long, 5—11 cm. broad; midrib slender, raised on both surfaces;  
main nerves 8—10 pairs, irregular, curving upwards and the upper ones interarching;  
secondary nerves and transverse nervules irregularly but prominently netted as  
is the reticulation; petiole thickened at base, up to 1 cm. long, bordered  
above by the decurrent margins of the blade. *Flowers* pale yellow, in  
pairs or single, rather distant, from the rhachis of a cylindrical

raceme reaching 20—30 cm. in length, from the axils of fallen leaves of the previous year's wood; pedicels at right angles to the rachis, 3—5 mm. long; bract and bracteoles very small, acute, caducous; perianth rather thick, in bud linear-clavate, 2—3 cm. long; hypogynous scales connate, truncate, dentate, 1 mm. long. *Stamens* 4; anthers oblong, 2-celled; filaments very short, connective produced in a blunt apiculus. *Ovary* glabrous, style as long as the perianth, stigma ellipsoid-clavate. *Fruit* ovoid, 3—4 cm. long, 2—3.5 cm. in diam., narrowed at both ends, obscurely 6-angled, the thickened pedicel 3 mm. in diam. *Seeds* 1—2, subglobose, testa thinly leathery; cotyledons hemispheric. Benn. in Horsf. Pl. Jav. Rar. 83; Meissn. in DC. Prodr. XIV. 439; Miq. Fl. Ind. Bat. I. i. 985; Hook. f. Fl. Br. Ind. V. 190; Koord. & Val. Bijdr. V. 313. *Rhopala attenuata*, Jack in McLell. Calc. Journ. IV. 352; and in Mal. Misc. I. 2. 10; Hook. Bot. Misc. II. 65; Wall. Cat. 1040; Walp. Ann. I. 592, V. 313. *R. moluccana*, Roxb. Hort. Beng. 83; Fl. Ind. Ed. Carey and Wall. I. 364 and Fl. Ind. I. 361 non Br. nec Jack. *R. racemosa*, Roxb. M.S. in Herbb. Linn. Soc. Lond. and Kew.

PENANG: *Jack* (Wallich 1040!); at Tulloh Bahang, *Curtis* 1181!; at Waterfall, *Curtis* 2765!; *Ridley* 12683!. PERAK: *Scortechini* 195!, 196!, 795!; at Batu Togo, Tupai, Waterfall Hill, etc. *Wray* 2159!, 2671!, 3144!, 3156!, 4052!; in various places from sea level to 600 m. alt., *King's Collector* 764!, 3383!, 4301!, 4594!, 5931!, 8496!, 8795!. SELANGOR: at Kwala Lumpur, *Curtis* 2372!; at Dusum Tua, *Ridley*!. PAHANG: at Tahan river, *Ridley*!. JOHORE: at Mount Austin, *Ridley* 13008!.—DISTRIB. Java (*Koorders*).

2. *HELICIA PETIOLARIS*, Benn. in Horsf. Pl. Jav. Rar. 84 (1838). A tree reaching 18—20 m. in height and 45—60 cm. in diam. of stem; branches spreading; branchlets stout, smooth, grey, uppermost nearly black and angled; all parts glabrous. *Leaves* firmly coriaceous; broadly obovate, obtuse or obtusely acute at apex, long-cuneate at base, rarely slightly lobed; upper surface shining, olive-green, lower also somewhat shining and purplish when dry; margins entire; 10—35 cm. long, 5—15 cm. broad; midrib stout, raised on both surfaces; main nerves 7—9 pairs, somewhat impressed above, spreading, curving upwards to join in diminishing loops near the margin; secondary nerves and transverse nervules irregularly netted, all nerves and reticulation slightly raised on both surfaces; petiole 2—3 cm. long, channelled above by the decurrent margins of the blade, the base enlarged. *Flowers* cream-



coloured, geminate, on bifid pedicels from the stout angular rachis of an elongated axillary or lateral raceme reaching 20—30 cm. in length; pedicels at right angles to the rachis, 4—6 mm. long, the two branches slightly shorter; bract and bracteoles minute, acute, caducous; perianth very thick, coriaceous, in bud linear-clavate, 2—2.5 cm. long, the limb of the lobes elliptic, the lobes spirally recurved in flower; hypogynous scales connate, truncated, toothed, 1 mm. long. *Stamens* 4; anthers oblong, 2-celled, 3 mm. long; filaments very short; connective produced in an ovate apiculus. *Ovary* glabrous; style nearly as long as the perianth lobes; stigma clavate, sulcate. *Fruit* depressed-ovoid, shortly pointed, 2 cm. long, 2.5 cm. in diam., smooth; pedicel little thickened, 2 mm. in diam. *Seed* subglobose, testa membranous, cotyledons hemispheric. Meissn. in DC. Prodr. XIV. 438; Miq. Fl. Ind. Bat. I. i. 983; Hook. f. Fl. Br. Ind. v. 190. *Rhopala moluccana*, Jack in McClell. Calc. Journ. 208, Mal. Misc. I. ii. 10; Hook. Bot. Misc. II. 65; Wall. Cat. 1041 non Br. nec Roxb.

PENANG: Cultivated, *Jack* (*Wallich* 1041!). PERAK: at Goping, *Scortechini* 1977!; in various places in forest up to 250 m. alt., *King's Collector* 4641!, 5438!, 8442!, 8687!. SELANGOR: 15th mile Pahang track, *Ridley* 8499!; at Kwala Lumpur, *Goodenough* 10472!. SINGAPORE: *Ridley* 3625!, 4695!, 4696!, 6257!, etc; at Changi Reserve, *Goodenough* 141!

3. *HELICIA KINGIANA*, Prain in Kew Bull. 342 (1912). A tree, reaching a height of 15—20 m. and 30—45 cm. in diam. of stem, all parts quite glabrous; branches spreading; branchlets stout, smooth, dark grey to nearly black, uppermost sharply angled. *Leaves* coriaceous; obovate or elliptic-obovate, rounded or shortly obtusely sometimes emarginately acuminate at apex, cuneately attenuate at base; upper surface light green, dark olive-green when dry, lower purplish brown when dry, both surfaces dull; margins entire, recurved; 15—25 cm. long, 6—11 cm. broad; midrib stout, raised on both surfaces; main nerves 10—12 pairs, the lowest 1—2 pairs very oblique from close to the base, the rest more widely curving and joining in gradually diminishing loops; transverse nervules prominent, irregular, angularly branching and enclosing an angular areolate reticulation; petiole none or very short, the margins of the blade extending to the enlarged base. *Racemes* stout, stiff, singly from the axils of the leaves or of fallen leaves, up to 30 cm. long; pedicels stout, 4—5 mm. long, bearing two flowers on branches 4.5—6 mm. long; bract and

bracteoles minute, acute, caducous; perianth in bud 3.5—4 cm. long, thick, the apex angular; hypogynous scales connate in a truncate slightly dentate cup 1—1.5 mm. long. *Stamens* with elliptic anthers, the connective broad, its apiculus blunt, cells 3—3.5 mm. long; filaments broad, 2 mm. long. *Ovary* ovoid, glabrous; style and clavate stigma as long as perianth. *Fruit* globose or ovoid, somewhat pointed at both ends, ridged on one side, 3—4 cm. long, 2—3 cm. broad; pericarp smooth, 2 mm. thick. *Seed* conform to the drupe; testa membranous; cotyledons 2—4, granular.

PERAK: in open forest, from the low ground to the tops of hills 250—300 m. alt. near Larut, *King's Collector* 3714!, 3881!, 6217!; at lower camp, Gunong Batu Putih, 1200 m. alt., *Wray* 983!, 1160!.

4. *HELICIA ROBUSTA*, Wall. Cat. 2702 (1820). A small tree reaching 8 m. in height and 15 cm. in diam. of stem; branchlets smooth with greyish-brown bark; all parts quite glabrous except sometimes the rhachis of the racemes which is slightly puberulous. *Leaves* subcoriaceous; obovate or oblanceolate, obtuse or obtusely acute or even acuminate at apex, cuneately narrowed in the lower half, finally rounded or subcordate; upper surface dull or shining, greenish when dry, lower dull dark brown; margin coarsely serrate, the lower part often entire; 15—25 cm. long, 6—12 cm. broad; midrib stout, raised on both surfaces; main nerves 10—12 pairs, irregular, usually obliquely curved to the margin; transverse nervules irregularly netted, prominent; petiole none or very short and much thickened. *Racemes* axillary, up to 30 cm. long, the rhachis moderately stout, angled; pedicels short, dividing near the base into two usually of different lengths, in all nearly 5 mm. long; bract and bracteoles minute, acute; perianth thin, in bud linear clavate, 2—3 cm. long, the limb of the lobes elliptic, recurved, the lobes spirally recurved in flower; hypogynous scales more or less connate, truncate, denticulate, 1—1.5 mm. long. *Stamens* 4; anthers oblong, 3 mm. long; filaments very short; connective produced in a rounded apiculus. *Ovary* glabrous, style nearly as long as the perianth lobes; stigma clavate, sulcate. *Fruit* obliquely globose, apiculate, obscurely 4—6—ribbed, reaching 2.5—3 cm. in diam., smooth; fruiting pedicel very short, 4 mm. in diam. *Seed* globose, testa very thin, cotyledons hemispheric. Bl. in Ann. Sc. Nat. Ser. 2. i. 220; Benn. in Horsf. Pl. Jav. Rar. 83; Meissn. in DC. Prodr. XIV. 440; Miq. Fl. Ind. Bat. I. i. 986; Kurz For. Fl. II. 311; Hook.

f. Fl. Br. Ind. v. 191; Brandis Ind. Trees 543. *H. macrophylla*, Wall. Cat. 3661. *H. javanica*, Bl. in Ann. Sc. Nat. Ser. 2. i. 217; Benn. l.c. 83, t. 18; Meissn. l.c. 440; Miq. l.c. 986; Koord. & Val. Bijdr. V. 306. *H. castaneæfolia*, Meissn. l.c. 441. *Helittophyllum javanicum*, Blume Bijdr. 652. *Rhopala robusta*, Roxb. Fl. Ind. ed. Carey & Wall. I. 366 and Fl. Ind. I. 363; Wight Ic. t. 191. *R. glabrata*, Wall. Cat. 1039.

MALACCA: *Griffith* K. D. 4367!; *Cuming* 2338!; *Maingay* K. D. 1309!, 1311!; at Sungei Udang, *Derry* 523!. SELANGOR: at Kwala Lumpur, *Ridley* 10225!.—JOHORE: at Bukit Tana Abang, *Lake & Kelsall* 4010!. DISTRIB: India (Assam and Khasia), Burma, Java, (*Forbes* 377!, 670!, 2731! etc.), Sumatra (*Forbes* 2212!).

5. *HELICIA RUFESCENS*, Prain in Kew Bull. 342 (1912). A largetree reaching a height of 18—24 m. and 60 cm. or more in diam. of stem; branches spreading; branchlets stout, dark ashy grey, the uppermost densely dark rufous-tomentose. *Leaves* subcoriaceous; obovate or broadly oblanceolate, acute or very shortly acuminate at apex, long cuneate at base; upper surface dark green, dull olive-green when dry, glabrous except on the midrib and nerves when young, lower reddish brown, densely rufous—pubescent when young, gradually glabrescent when older; margin entire; 15—30 cm. long, 6—11 cm. broad; midrib prominent, raised on both surfaces, crispedly brown-puberulous above; main nerves 16—20 pairs, close and parallel and straight in the lower, more distant and curved in the upper half and there joining in angular loops; transverse nervules irregular, angled and branched; reticulation irregular, prominent; petiole 3—4 cm. long, thickened at base, densely rufous-tomentose. *Racemes* single or in pairs from the axils of the leaves or of fallen leaves, densely dark rufous—pubescent, 15—20 cm. long; pedicel short, 1 mm. long, bearing two flowers on branches 2 mm. long; bract and bracteoles ovate, minute; perianth in bud 10—12 mm. long, the lobes in flower very much spirally curved, glabrous within; hypogynous scales free, obtuse, glabrous. *Stamens* with linear anthers 2·5—3 mm. long, the connective apiculus blunt; filaments slender, 1 mm. long. *Ovary* densely rufous-villous; style slender, including the cylindrical grooved stigma as long as perianth. *Fruit* yellowish—brown, subglobose, flattened on both sides, slightly ridged on the outer, apex and base acute, 3 cm. long, 2·5 cm. broad, 1·5 cm. thick, rufous-tomentose, gradually becoming glabrescent; pericarp 2—3

mm. thick. *Seed* conform to the fruit, testa membranous; cotyledons fleshy, channelled across the middle.

PERAK: in open forests about Larut and Thaiping, on hills from 150—450 m. alt., *King's Collector* 4213!, 4939!, 5096!, 8504!; at Waterfall Hill and Tapai, *Wray* 2083!, 3084!.

6. *HELICIA VELUTINA*, Prain in Kew Bull. 343 (1912). A tree reaching a height of 15—20 cm. and 25—33 cm. in diam. of stem; branchlets stout, grey, striate, the uppermost minutely grey-puberulous. *Leaves* chartaceous; broadly oblanceolate, rather abruptly acuminate at apex, cuneate at base; upper surface bright green, olive green and shining when dry, glabrous, lower also somewhat shining, plumbeous, glabrous except a slight pubescence along the midrib; margin entire, recurved when dry; 10—20 cm. long, 4—7 cm. broad; midrib moderately stout, prominent on both surfaces; main nerves 14—16 pairs, impressed above, raised beneath, straight and parallel, interarching near the margin; secondary nerves and transverse nervules irregular, branched, enclosing an angular reticulation; petiole 1—1.5 cm. long, thickened at base, the upper part bordered by the decurrent margins of the blade. *Racemes* single or in pairs from the axils of fallen leaves on the past year's wood chiefly, up to 7 cm. long (bud—specimens only), densely rufous velvety; flowers densely congested, in pairs on very short pedicels or sessile, ascending; bract linear, 7—8 mm. long, bracteoles linear, 4—5 mm. long; perianth in bud shortly and thickly clavate, 5 mm. long, glabrous within; hypogynous scales minute, free, truncate, glabrous. *Stamens* with oblong nearly sessile anthers, the connective-apiculus short, thick. *Ovary* ovoid, glabrous; style thick, stigma clavate. *Fruit* not known.

PERAK: in open forest at Gunong Bubu, Larut, 600—750 m. alt., *King's Collector* 7316!

7. *HELICIA EXCELSA*, Bl. in Ann. Sc. Nat. Ser. 2. i. 219 (1834). A large tree reaching 18—24 m. in height and 40—50 cm. in diam. of stem; bark grey, scabrous; branches spreading; branchlets rather slender, grey, the uppermost and innovations densely dark rusty-tomentose. *Leaves* coriaceous; obovate or oblanceolate, abruptly acuminate at apex, long cuneate at base; margins entire or rarely the upper part coarsely serrate; both surfaces glabrous, yellowish-green when dry, the upper shining; 10—15 cm.

long, 3—6 cm. broad; midrib slender, raised beneath; main nerves 6—8 pairs, irregular, raised on the upper surface, soon branching and irregularly anastomosing; reticulation irregular, prominent; petiole slender, 1—2 cm. long, the upper part bordered by the decurrent margins of the blade. *Flowers* yellowish-green, in pairs in axillary or terminal racemes 5—10 cm. long, densely dark rusty-villous; pedicels 1—2 mm. long, 2-flowered, branches 1—1.5 mm. long; bract acuminate, 1—2 mm. long, at the bases of the pedicels, bracteoles on the branches 1 mm.; perianth slender, 4—6 mm. long, clavate in bud; hypogynous scales 4, free, ovoid, glabrous, .5 mm. long. *Stamens* 4; anthers 1—2 mm. long, the connective rugose, produced in a short apiculus. *Ovary* ovoid, ferruginous-villous; style slender, as long as perianth; stigma clavate. *Fruit* ovoid, oblique, smooth, 10 mm. long, 7—8 mm. in diam.; pedicel slightly thickened, 3 mm. in diam. Benn. in Horsf. Pl. Jav. Rar. 84; Meissn. in DC. Prodr. XIV. 441; Kurz For. Fl. II. 312; Miq. Fl. Ind. Bat. I. i. 987; Hook. f. Fl. Br. Ind. V. 191. *Rhopala excelsa*, Roxb. Fl. Ind. I. 363 and ed. Carey & Wall. I. 365; Spr. Syst. Veg. I. 482. 11; Roem. & Sch. Syst. Veg. Mant. III. 285; Wight Ic. t. 190 (copied from Roxb.).

PERAK: on tops of low hills in open jungle near Goping and Ulu Bubong, 90—250 m. alt., *King's Collector* 5928!, 6100!, 10836!; near Gunong Bubu, *Scortechini* 774!. MALACCA: at Sungei Hudang, etc. *Goodenough* 1388! 1760!; *Derry* 456!, 530!. SINGAPORE: at Chenchukang, *Goodenough* 2759!; at Kranji, *Ridley* 6428!.—DISTRIB. India (Chittagong), Burma (Tenasserim).

Var. *salicifolia*. Innovations nearly glabrous. *Leaves* narrower, less abruptly and obtusely acuminate at apex, entire. *Racemes* longer, 10—13 cm. long, the rachis and perianth nearly glabrous, the bract and bracteoles longer; the hypogynous scales 1 mm. long, oblong. *Fruit* larger, nearly 2 cm. long, 10—12 mm. broad, blue-black when ripe. *H. salicifolia*, Presl. Epimel. Bot. 247 (1849); Meissn. in DC. Prodr. XIV. 439; Kurz For. Fl. II. 312. *H. excelsa* var. *edentula* Benn. in Horsf. Pl. Jav. Rar. 84.

PERAK: in dense jungle on low ground, Goping, *King's Collector* 691!, 6096!; at Simpang, *Wray* 2310!; at Gunong Haram Parah, *Scortechini* 687!. MALACCA: *Maingay* K. D. 1310!; at Sungei Hudang, *Derry* 1202!.—DISTRIB. Burma (Tenasserim, *Helper* 4366!)

var. *Forbesii*. Similar to the last, but the *leaves* much larger, 12—22 cm. long, 4—8 cm. broad; main nerves up to 10 pairs.

*Racemes* still more glabrous, longer, up to 15 cm.; perianth longer and more slender; bract broader.

PERAK: in open jungle on low ground near Larut, *King's Collector* 3392!.—DISTRIB. Sumatra (at Moeara Merg Kulem, 450 m. alt. *Forbes*, 3047 a!.)

8. *HELICIA SCORTECHINII*, Gamble in Kew Bull. 117 (1913). A tree?, branchlets smooth, pale brown, the youngest slightly puberulous. *Leaves* chartaceous; oblanceolate, abruptly caudate—acuminate at apex, cuneate at base; both surfaces dull, the upper nearly black when dry, glabrous, the lower reddish-brown with a few hairs scattered on the surface; margin shortly but closely serrate on the upper two-thirds, entire towards the base; 12—18 cm. long, 4—6 cm. broad; midrib slender, prominent beneath; main nerves 8—10 pairs curving towards the margin and there joined in angular loops, prominent beneath; transverse nervules irregular, branching, enclosing an irregular reticulation; petiole about 1 cm. long, the margins of the blade decurrent almost to its base. *Racemes* (young only) from the axils of fallen leaves, solitary or geminate, minutely ferruginous-hirsute; pedicels short, 2-flowered; bract ovate, acuminate, 2 mm. long; bracteoles similar, 1 mm. long; perianth in bud clavate; hypogynous scales free, ovate, glabrous. *Ovary* glabrous, style short, stigma cylindric clavate. *Fruit* not known.

PERAK: *Scortechini* 467!.

The specimens are in bud only and the description is taken almost entirely from that of Father Scortechini.

9. *HELICIA CURTISII*, Gamble in Kew Bull. 116 (1913). A tree reaching 6—9 m. in height; branchlets pale brown, smooth, glabrous. *Leaves* chartaceous; oblanceolate, acuminate, often obtusely, at apex, long-attenuate at base; both surfaces glabrous, olive-brown when dry, the lower rather paler and reddish; margins strongly serrate from the middle upwards; 12—18 cm. long, 4—6 cm. broad; midrib slender, prominent beneath; main nerves 8—10 pairs, prominent especially beneath, curving to near the margin and there more or less interarching; transverse nervules few, branching and enclosing the areolate reticulation; petiole under 1 cm. long, the margins of the blade decurrent nearly to its base. *Racemes* axillary, slender, 15—20 cm. long, the rhachis and pedicels minutely rusty-

puberulous when young, later glabrescent; pedicels slender, 2 mm. long, then bifid, the branches as long again; bract and bracteoles minute, caducous; perianth in bud clavate, slender, thin, 7—8 mm. long, the lobes oblong acute; hypogynous scales free, ovate, obtuse, 1 mm. long. *Stamens* 4; anthers oblong, connective apiculate; filaments short, flattened. *Ovary* ovoid, ferruginous-villous; style 5—6 mm. long, very slender; stigma narrowly cylindrical. *Fruit* not known.

PENANG: at Penara Bukit, 450 m. alt., *Curtis* 3020!

Family CVII. LORANTHACEÆ.

Evergreen shrubs, rarely herbs, usually parasitic on the branches of trees; stems much-branched, often jointed. *Leaves* usually opposite sometimes alternate, coriaceous, entire, sometimes reduced to scales or absent; stipules none. *Flowers* regular or zygomorphic, hermaphrodite or unisexual, sometimes large and brightly coloured, sometimes inconspicuous; racemose, spicate, capitata or fascicled, usually bracteate and often with 2 or more bracteoles. *Calyx* adnate to the ovary; limb annular or cupular, truncate, entire or shortly toothed, sometimes none. *Petals* or perianth segments 3—8, valvate, free or more or less connate in a tube. *Stamens* as many as, and opposite to, the petals and more or less adnate to them; filaments slender or none; anthers basifixed or dorsifixed, opening by longitudinal slits or by rows of cells or by pores. *Ovary* inferior, 1-celled; usually without distinct placenta or ovule; style short or long; stigma simple or hardly lobed. *Fruit* a 1-seeded berry or drupe with fleshy pericarp and often viscid mesocarp. *Seed* solitary without distinct testa; albumen fleshy or absent; embryos 1, rarely 2, with distinct hypocotyl and 2 or more cotyledons; radicle superior. **DISTRIB.** Chiefly tropical, a few in temperate regions. Many species.

Calyx present though the limb is sometimes reduced to merely a rim; flowers hermaphrodite (Subf. I. LORANTHACEÆ).

Calyx-tube supported by a bract, no bracteoles

- |                    |    |    |    |                |
|--------------------|----|----|----|----------------|
| Anthers basifixed  | .. | .. | .. | 1. LORANTHUS.  |
| Anthers dorsifixed | .. | .. | .. | 2. LOXANTHERA. |

Calyx-tube supported by a bract and two bracteoles;

- |                   |    |    |    |                |
|-------------------|----|----|----|----------------|
| anthers basifixed | .. | .. | .. | 3. ELYTRANTHE. |
|-------------------|----|----|----|----------------|

- Calyx-tube without bract, bracteoles 0—4; inflorescence capitate, involucrate; anthers basifixed .. .. . 4. LEPEOSTEGERES.
- Calyx obsolete or represented by a rim; flowers unisexual (Subf. II. VISCÆÆ).
- Anthers 2-celled, opening longitudinally.
- Plants with leaves; flowers monœcious in jointed spikes, at the bases of the joints .. .. . 5. GINALLOA.
- Plants without leaves; flowers diœcious or monœcious surrounding the bases of the internodes 6. KORTHALSELLA.
- Anthers opening by many pores; flowers in axillary triads or flattened capitula.
- Plants with leaves or leafless; anthers combined with the perianth-lobes .. .. . 7. VISCUM.
- Plants with leaves; anthers not combined with the perianth-lobes .. .. . 8. NOTOTHIXOS.

I have been unable to examine specimens of *Nallogia Gaudichaudiana*, H. Baill. in Bull. Soc. Linn. Par. II. 985 (1892) said to be a Malacca tree (?) with cylindric branches, alternate membranous leaves and axillary flowers of which only the ♂ are known. The perianth is 5-lobed and the anthers open by lateral clefts. For the generic description see Baill. Hist. des Pl. XI. 478.

#### 1. LORANTHUS, Linn. (restricted).

Parasitic shrubs, with many branches. *Leaves* opposite, subopposite or alternate, usually thick and fleshy or coriaceous, entire. *Flowers* hermaphrodite, usually coloured, in racemes spikes or fascicles, in the axils of the leaves or of fallen leaves, rarely terminal; bract usually small, supporting the base of the calyx-tube, no bracteoles. *Calyx*-tube adnate to the ovary; the limb short, truncate or toothed, sometimes almost obsolete. *Corolla* polypetalous or gamopetalous, regular or zygomorphic; lobes 4—6, valvate, free or more or less connate in a tube, erect or reflexed, the tube often split down one side. *Stamens* as many as the corolla-lobes and adnate to them; filaments slender or thickened; anthers basifixed, usually linear, opening by longitudinal cells, sometimes transversely septate. *Disk* none. *Ovary* 1-celled; style filiform, sometimes geniculate; stigma entire, obtuse or capitate. *Fruit* baccate, usually globose ovoid or ellipsoid, crowned by the persistent calyx. *Seed* albuminous, adnate to the pericarp, often surrounded by glutinous pulp; testa none; embryo straight, terete. **DISTRIB.** Most tropical countries of the Old World.



Corolla lobes free (Subgenus I. EULORANTHUS)

Flowers in racemes or spikes.

Petals 5 (Sect. I. LORANTHOBOTRYS).

Racemes involucrate at base (Subsect. 1. CHRIDIUM).

Leaves sometimes whorled, lanceolate to ovate-oblong, 8—20 cm. long .. .. 1. *L. pulcher*.

Raceme-bases sunk in the substance of the branchlet; style filiform (Subsect. 2. COLEOBOTRYS).

Leaves elliptic or lanceolate, acute, 7—13 cm. long; petals rather thin; anthers 13—14 mm. long, septate .. .. 2. *L. heteranthus*.

Leaves elliptic or obovate, obtuse, 4—6 cm. long; petals very thick; anthers 8 mm. long, septate .. .. 3. *L. crassipetalus*.

Racemes not involucrate or sunk in a protuberance of the branchlet; style articulate (Subsect. 3. LANTHORUS) .. .. 4. *L. pentapetalus*.

Petals 4 (Sect. II. PHENICANTHEMUM).

Racemes 5—7 cm. long, rusty-pubescent; style not articulate .. .. 5. *L. coccineus*.

Flowers in sessile clusters; petals 4 (Sect. III. BARATRANTHUS).

Heads always axillary (Subsect. I. CYATHISCUS) .. 6. *L. productus*.

Heads rarely axillary, usually opposite in clusters on the internodes (Subsect. 2. EUBARATRANTHUS) .. 7. *L. Lobbii*.

Corolla gamopetalous (Subgenus II. DENDROPHTHOE) ..

Corolla 4-lobed; fruit more or less pearshaped (Sect. I. CICHLANTHUS). [septate.

Fruit more or less stalked, pyriform; anthers not

Fruit gradually contracted into the stalk; flowers usually single or in few-flowered racemes; leaves more or less oblong .. .. 8. *L. obtectus*.

Fruit truncate at top, less gradually contracted; flowers in densely fascicled cymes; leaves elliptic, tomentose beneath .. .. 9. *L. ferrugineus*.

Fruit abruptly contracted into a slender stalk; flowers in few-flowered cymes; leaves elliptic, glabrous when old beneath .. .. 10. *L. malaccensis*.

Fruit not stalked, oblong, rugose; flowers in pairs or threes in umbellate cymes; anthers septate .. 11. *L. estipitatus*.

Corolla 5-lobed; fruit ovoid (Sect. II. EUDENDROPHTHOE).

Branchlets, leaves beneath and inflorescence with orange rusty tomentum, leaves ovate lanceolate, acuminate, 8—13 cm long; corolla inflated in the middle, 4 cm. long; racemes 2.5 cm. long. .. .. 12. *L. Casuarinæ*.

Branchlets and leaves beneath glabrous; in inflorescence sometimes puberulous or furfuraceous.

Racemes under 1.5 cm. long, furfuraceous; corolla

- funnel-shaped, under 2 cm. long; leaves very coriaceous .. .. 13. *L. crassus*.
- Racemes 2—3 cm. long, grey-pubescent; corolla ventricose at base, 1.5—2 cm. long; leaves thickly coriaceous .. .. 14. *L. pentandrus*.
- Racemes 4—7 cm. long, glabrous; corolla gradually enlarging, 4 cm. long; leaves coriaceous .. 15. *L. longiflorus*.
- Racemes 6—10 cm. long, glabrous; corolla inflated above the middle, 6—8 cm. long; leaves very coriaceous, large. .. .. 16. *L. grandifrons*.
- Corolla 6-lobed; fruit cylindric.
- Pedicels 1-flowered (Sect. III. KINGELLA).
- Leaves oblong, over 18 cm. long; corolla 10 cm. long; anthers 8—10 mm. long .. .. 17. *L. Scortechinii*.
- Pedicels 2-flowered (Sect. IV. ARCULUS).
- Leaves elliptic, under 8 cm. long; corolla 4—5 cm. long; anthers 2 mm. long .. .. 18. *L. Duthieanus*.

1. *LORANTHUS PULCHER*, DC. Prodr. IV. 295 (1830). A large parasitic shrub growing in large masses on the stems of trees and reaching 6—8 ft. or more in height; branchlets robust, terete, with greenish-grey, shining papery bark, uppermost angular; lenticels elongate, leafscars very prominent. *Leaves* opposite or subopposite, sometimes whorled, very coriaceous, glabrous; lanceolate, ovate or elliptic oblong, long-acuminate at apex, acute to rounded at base; upper surface dark green, lower paler, both light olive-brown when dry and minutely impressed punctate; margin recurved; 8—20 cm. long, 2—8 cm. broad; midrib stout; main nerves about 6—10 pairs, nearly horizontal, short and interarching near the margin, rarely visible; petiole stout, variable, 5—20 mm. long. *Racemes* or spikes subterminal or axillary, solitary or fascicled, densely-flowered from base to point, 10—30 cm. long; the bases surrounded by an involucre of linear tawny scales; rhachis stout; pedicels thick, up to 3 mm. long; bract boat-shaped, acute and ciliate at apex. *Calyx* urceolate, 2—3 mm. long; limb annular. *Corolla* in bud 8 mm. long, constricted in the middle; petals 5, red or the tips yellowish, linear oblong, acute at tip, recurved when open from the middle, the upper part above the stamens having, beneath the thin inner epidermis, a layer of long narrow unicellular hairs, otherwise glabrous. *Stamens* inserted on the middle of the petals with a rugosity below them; filaments flat, 1—2 mm. long; anthers 2 mm. long, the inner valves of the cells shorter than the outer which are curved at the top. *Ovary* short; style somewhat stout, 6 mm. long; stigma hardly capitate. *Fruit* subcylindric, truncate at apex, 5—6 mm. long, pericarp greenish-sticky within. *Seed* toothed at

tip, embryo minute. Hook. f. in Fl. Br. Ind. V. 205; King in Journ. As. Soc. Beng. lvi. ii. 90. *L. speciosus*, Wall. Cat. 578. *L. coccineus*, Hook. Bot. Misc. t. 58 (not of p. 278). *Dendrophthoe pulcher*, Miq. Fl. Ind. Bat. I. i. 821. *Chiridium speciosum*, van Tieghem in Bull. Soc. Bot. Fr. XLI. 541.

SIAMESE STATES: Setub, *Ridley* 14923!. KEDAH: Rawei island, *Ridley* 15704!. PENANG: *Porter* (*Wallich* 578)!. *Phillips*!.; at 90—300 m. alt., *King's Collector* 2281!, 4868!.; *Curtis* 394!.; on Penang Hill, *Ridley* 9390!. PERAK: at Sungie Larut, etc., *Wray* 2296!.; 3225!.; on hills up to 1200 m. alt., *King's Collector* 6257!.; 6407!.; 10540!. PAHANG: at Tahan river, *Ridley* 2410!?! (leaves very shining and thinner).

*L. puniceus*, Wall. Cat. 522; Hook. f. Fl. Br. Ind. V. 223 seems to be this species and was identified with it, in the Calcutta Herbarium, by the late Sir George King.

var. *Parishii*. Leaves linear lanceolate, verticilled at the summit. Racemes subterminal in the axils of the whorl of leaves. *L. Parishii*, Hook. f. in Fl. Br. Ind. V. 205. *L. perakensis*, Engl. in Engl. & Prantl Nachtr. 129. *Chiridium verticillatum*, van Tieghem in Bull. Soc. Bot. Fr. XLI, 541.

PERAK: *Scortechini* 231!.; at Larut at about 300 m. alt., *King's Collector* 6278!. SELANGOR: at Bukit Kutu, *Ridley* 7617!..—DISTRIB. Tenasserim (*Parish* 3005!); Siam (*Kerr* 1763!)

2. LORANTHUS HETERANTHUS, Wall. Cat. 537 (1828). A stout parasitic shrub reaching 3 m. or more in height, nearly glabrous; branchlets stout, terete, dark brown or nearly black, older shining; leaf and raceme scars very prominent. Leaves coriaceous, alternate or opposite; elliptic or oblong-lanceolate or linear-lanceolate, obtusely acute at apex, attenuate at base; both surfaces glabrous, upper shining and obliquely striolate, lower dull, pale yellowish-brown when dry; margins subsinuous, recurved; 7—13 cm. long, 2—5 cm. broad; midrib rather slender, raised on both surfaces; main nerves about 10 pairs, joined in loops near the margin, obscure as is the reticulation; petiole stout, 2—3 cm. long, easily disarticulated. Racemes solitary or 2—3 together, terminal and axillary, the base more or less immersed in the branchlets, surrounded by a shallow cup, often curved, red, rusty-puberulous when young, up to 17 cm. long, very sparsely flowered; rhachis angular; pedicels stout, at right angles to rhachis, about 1 cm. long; bract lateral, boatshaped, concave, ciliate; flowers in bud curved upwards, very slender, acute, about 3—4 cm. long. Calyx cylindric, 7—8 mm. long, striate, limb slightly spreading, entire.

*Petals* 5—6, linear, crimson, 2—3 cm. long, about 1 mm. broad, base rather broader, upper part reflexed in flower, epidermis on inner side thin with a layer of long unicellular hairs beneath. *Stamens* inserted near the base of the petals, very slender, apiculate; filaments 3—4 mm. long; anthers 13—14 mm. long; cells 2, marginal, conspicuously transversely septate. *Ovary* cylindrical; style filiform, angular, rugose, nearly 2 cm. long; stigma simple. *Fruit* urceolate, glabrous, striate, 9 mm. long, 5 mm. in diam.; seed obovoid; embryo slender. DC. Prodr. V. 306; Hook. f. Fl. Br. Ind. V. 208; King in Journ. As. Soc. Beng. LVI. ii. 91; Brandis Ind. Trees 548; Prain Beng. Plants 911; Koord. Exkurs. Fl. Jav. II. 157. *L. eleutheropetalus*, Kurz in Journ. As. Soc. Beng. XL. ii. 64 and For. Fl. II. 321. *Dendrophthoe macrocalyx*, Miq. Fl. Ind. Bat. I. i, 821. *Coleobotrys heterantha*, van Tiegh. Bull. Soc. Bot. Fr. XVI. 542.

KEDAH: on Kedah Peak, 900 m. alt., *Ridley* 5484!. PERAK: at Haram Purah, *Scortechini* 860!; up to 1000 m. alt., *Wray* 1172!, 3234!; on trees near Larut at 750—1000 m. alt., *King's Collector* 6362!; at Temango on Durians, *Ridley* 14566!. PAHANG: at Kwala Pahang, *Ridley* 1809!.—DISTRIB. India (Chittagong), Burma, Siam (*Schmidt* 695!), Java, Borneo (*Haviland*), Sumatra (*Forbes* 2867!).

3. LORANTHUS CRASSIPETALUS, King in Journ. As. Soc. Beng. LVI. ii. 91 (1887). A parasitic shrub; branchlets very stout, striate with lines from below the leaves or leafscars; bark shining, nearly black when dry. *Leaves* coriaceous, alternate; elliptic or obovate, obtuse at apex, attenuate at base; glabrous, striolate, upper surface shining, lower dull; margins recurved; 4—10 cm. long, 2—5 cm. broad; midrib slightly prominent; main nerves invisible when fresh, obscure when dry as is the reticulation; petiole 5—7 mm. long, stout. *Racemes* solitary or in pairs, axillary, stout, rigid, erect, sparsely many-flowered, 5—15 cm. long, the base enclosed in a thick walled hollow in the branchlet, and subtended by an orbicular ciliate involucreal scale: rhachis angular, striate, slightly puberulous; pedicels stout, at about 60° with the rhachis, 2—5 mm. long; bract broad, cochleate, continuing the pedicel and half embracing the calyx tube; flowers erect, nearly parallel to the rhachis, the corolla in bud narrowly conical. *Calyx*-tube cylindrical, 5—7 mm. long, striate, slightly puberulous; limb spreading, cupshaped, truncate, with a wavy margin, 1—1.5 mm. long. *Petals* 5, linear, very thick, acute at tip, smooth and yellowish externally, ridged and bright red internally, 18—22 mm. long, the inner epidermis layer covering a layer of linear unicellular hairs. *Stamens* very slender, inserted about  $\frac{1}{3}$  up

the petal: filaments quadrangular, 2—5 mm. long; anthers 8 mm. long with two very narrow transversely septate cells. *Ovary* cylindrical; style filiform, quadrangular, rugose; stigma minute. *Fruit* not known. *Coleobotrys crassisejala*, van. Tiegh. in Bull. Soc. Bot. Fr. XLI 542 ?

PERAK: on Gunong Idjou, *Scortechini* 363!, 521; camp on Ulu Batang Padang, 1500 m. alt., *Wray* 1507!; Larut Hills, *Rilley*!

Ridley's specimen in Herb. Singap. has the same flowers, but the leaves are larger and the racemes longer than in the other ones.

4. LORANTHUS PENTAPETALUS, Roxb. Fl. Ind. ed. Carey and Wall. II. 211 (1824). A large much branching parasitic shrub reaching 90—120 cm. in height; branchlets stout, terete, with dark blackish grey bark, glabrous, the youngest alternately compressed. *Leaves* coriaceous, opposite or sometimes alternate; ovate or ovate-lanceolate, sometimes elliptic or suborbicular, acute or acuminate, often obliquely, at apex, rounded or attenuate at base; both surfaces dark green and glabrous when fresh, the uppermost with purplish margins, nearly black when dry; 6—12 cm. long, 2—7 cm. broad; midrib stout, prominent beneath; main nerves about 6—8 pairs, very faint; reticulation irregular, obscure; petiole 1—2 cm. long, rather slender, furrowed. *Racemes* solitary or in pairs or threes from the axils of the leaves or of fallen leaves, 10—20 cm. long, all parts bright red in colour except the yellow tips of the petals, flower bearing almost to the base which is sunk in a circular protuberance of the branchlets; rhachis glabrous or slightly puberulous, slightly angular; pedicels very short, thick, at right angles to the rhachis, the flowers ascending so as, at first at any rate, to be parallel to the rhachis; bract ovate, acute, ciliate, appressed to the calyx tube; flowers in bud constricted in the middle, the basal part nearly globose. *Calyx* cylindrical, 2—3 mm. long, the limb obscurely toothed. *Petals* 5, the basal portion obovate, thick, glabrous and convex within, the neck transversely rugose, the upper portion ligulate, acute, reflexed in flower, the whole 6 mm. long. *Stamens* inserted above the neck of the petals; filaments broad, 1—2 mm. long; anthers elliptic, 1 mm. long, the inner valve of each cell shorter than the outer. *Ovary* shortly cylindrical; style slender, 5 mm. long, jointed in the middle, rugose, the lower half 4—5-angled, the upper slender; stigma small, subtruncate. *Fruit* crimson, ellipsoid, truncate at apex, 7 mm. long, 5 mm. in diam., seed obovoid. Roxb. Fl. Ind. I, 553; DC. Prodr. IV. 295; Wall. Pl. As. Rar. III. t. 225 and Cat. 503; Griff. Notul. IV. 617 and Ic. Pl. Asiat. tt. 624, 625; Blume Fl. Jav. Loranth. 39, tt. 14,

23 A; Kurz For. Fl. II. 322; Korth. Verh. Lor. 66; Hook. f. Fl. Br. Ind. V. 206; King in Journ. As. Soc. Beng. LVI. ii. 90; Engl. in Engl. & Prantl Naturl. Pflanzenfam. III. i. 185; Prain Beng. Plants 911; Brandis Ind. Trees 548; Koord. Exkurs. Fl. Jav. II. 158. *L. polycarpus*, Wall. Cat. 540. *L. erythrostachys*, Wall. MS. *Phaenicanthemum pentapetalum*, Miq. Fl. Ind. Bat. I. i. 823. *Dendrophihoe pentapetala*, G. Don Gen. Syst. III. 419. *Lanthorus pentapetalus*, van Tiegh. in Bull. Soc. Bot. Fr. XLI. 488.

PENANG: Government Hill, *Maingay* K.D. 691!, 692!; *Curtis* 205!; on trees at 300—750 m. alt., *King's Collector* 1522!; *Hullett* 167!; *Ridley* 9364!, 10780!. PERAK: on tree branches about Larut and Goping up to 900 m. alt., *King's Collector* 4227!, 4377!; on Gunong Batu Putih, 1000—1300 m. alt., *Wray* 406!, 466!, at the Cottage, Larut, 1300 m., *Wray* 4240!; *Scortechini* 390!; *Ridley* 2968!. SELANGOR: at Ginting Bidai, 600 m. alt., *Ridley* 7619!. MALACCA: *Griffith* K.D. 2724!, 2725!: at Serkam, *Derry* 1098!; *Hervey*!. PAHANG: at Pekan, *Ridley* 1072!. SINGAPORE: *Lobb* 327!.—DISTRIB. India (E. Himalaya, Assam, E. Bengal), Burma, Java, Sumatra, Borneo (at Kuching *Ridley* 11666!; *Haviland*), Siam (*Murton* 65!, *Kerr* 619!).

5. LORANTHUS COCCINEUS, Jack in Mal. Misc. I. 8 (1820). A parasitic shrub, reaching 90—120 cm. in height; branchlets stout, terete, light to dark brown, uppermost rusty or scurfy tomentose as are the innovations. *Leaves* coriaceous, alternate or subopposite; ovate or ovate-lanceolate, obtusely acute at apex, rounded or cordate at base; both surfaces glabrous or slightly puberulous, dark olive-green when dry; 6—12 cm. long, 3—7 cm. broad; midrib stout, prominent beneath; main nerves 5—7 pairs, curving and meeting in loops towards the margin; reticulation irregular; petiole 10—15 mm. long moderately stout. *Racemes* axillary, solitary or in pairs, stellately rusty-pubescent, 5—7 cm. long, erect or somewhat spreading, flower-bearing throughout; rhachis striate; pedicels very short, thick, nearly at right angles to the rhachis, the flowers sideways inserted so as, at first at any rate, to be closely parallel to the rhachis; bract cucullate, ovate, closely appressed to the calyx-tube; flowers in bud slightly constricted in the middle, 5—7 mm. long. *Calyx* cylindrical, slightly constricted below the annular obscurely 4-lobed limb, 1—2 mm. long. *Petals* 4, crimson, the basal portion ovate, glabrous within, the neck and ligulate upper portion with frilled margins, the whole 5—7 mm. long, the upper parts reflexed in flower. *Stamens* inserted at the

neck of the petals; filaments flat, 2 mm. long; anthers oblong, obtuse, the cells very narrow, marginal, separated by a broad connective. *Ovary* ovoid, 4-angled, the neck narrowed; style slender, 4-sided, not jointed; stigma large, reniform, capitate. *Fruit* reddish-brown, obtusely 4-angled, flask-shaped, truncate at tip, 8 mm. long; seed 4-angled. Hook. Bot. Misc. I. 278 (*excl.* t. 58); Roxb. Fl. Ind. Ed. Carey and Wall. II. 215; DC. Prod. IV. 296; Griff. Notul. IV. 620 and Ic. Pl. Asiat. t. 626; Kurz For. Fl. II. 322; Korth. Verh. Lor. 68; Hook. f. Fl. Br. Ind. V. 206; King in Journ. As. Soc. Beng. LVI. ii. 91; Brandis Ind. Trees 549. *L. racemiferus*, Wall. Cat. 539; DC. l.c. *Phoenicanthemum coccineum*, Miq. Fl. Ind. Bat. I. 825; van Tiegh. in Bull. Soc. Bot. Fr. XLI. 544. *P. Bennettianum*, Miq. l.c. 826. *Dendrophthoe coccineus*, G. Don Gen. Syst. III. 419. *D. ? racemiferus*, G. Don. l.c.

PENANG: on trees at 250—300 m. alt., *King's Collector* 4914!; Government Hill, *Curtis* 243!. PERAK: at Waterfall Hill, etc., 250 m. alt. *Wray* 2582!, 3270!; *Scortechini* 261!; on trees near Larut and Goping, *King's Collector* 1017!, 2323!, 8124!, 10524!. PAHANG: at Kwala Pahang, *Ridley* 1427!. SELANGOR: at Labu river, *Ridley* 7616!. MALACCA: *Griffith* K.D. 2718!; *Maingay* K.D. 690!; at Bukit Senggeh, *Goodenough* 1453!. JOHORE: at Bukit Kayara, *Ridley* 11340!. SINGAPORE: at Bukit Mandai, *Ridley's Collector* 6697!.—DISTRIB. India (Cachar), Burma, Andamans, Borneo (at Kuching *Haviland* 472!), Bangka.

6. LORANTHUS PRODUCTUS, King in Journ. As. Soc. Beng. LVI. ii. 91 (1887). A parasitic glabrous shrub with long branches; branchlets strongly 4-angled, slightly flattened especially at the nodes, dark brown to nearly black when dry. *Leaves* coriaceous, opposite; lanceolate or ovate, obtusely acute at apex, cuneately attenuate, often unequally, at base; blue-green when fresh, black-brown when dry and much wrinkled on both surfaces; margins subsinuate, recurved; 6—12 cm. long, 3—6 cm. broad; midrib stout, prominent on both surfaces; main nerves 3—8, very irregular, curving to and along the margin and joined in loops; reticulation obscure; petiole stout, 7—15 mm. long, bordered by the decurrent margins of the blade. *Flowers* crowded in axillary clusters, sessile; bract a short cylindric obscurely 2—4-crenate tube 4 mm. long, enveloping the calyx-tube; flowers in bud clavate about 1 cm. long. *Calyx-tube* very short; limb cylindric, truncate, dentate, ciliate on the margins, 4—5 mm. long. *Petals* 4, free, linear-oblong, acute, thick, 10—13

mm. long, reflexed in flower from about the middle, margins of slightly enlarged base ciliate. *Stamens* inserted a little below the middle of the petal, which is rugose below them; filaments broad, 4 mm. long; anthers about 3—4 mm. long, curved when mature; cells parallel, introrse, transversely septately pitted in a double row of cells, inner valves shorter than outer. *Ovary* ovoid; style linear, angled, rugose, slightly geniculate a little below the middle; stigma small, truncate. *Fruit* globose, 6—8 mm. in diam., smooth, crowned by the persistent rather long cylindric calyx-limb and enveloped at base by the persistent bract which forms a flattened cup; seed obovoid, surrounded except at the base by the sticky gum, embryo linear. *Cyathiscus productus*, van Tiegh. in Bull. Soc. Bot. Fr. XLI. 539.

PERAK: *Scortechinii* 391!, 581!; camp on Ulu Badang Padang, 1500 m. alt., *Wray* 1531!, 2949!; near Larut at 1000—1200 m. alt., *King's Collector* 3240!.

7. *LORANTHUS LOBBII*, Hook. f. in Fl. Br. Ind. V. 204 (1886). A parasitic shrub; branchlets terete with pale greyish-brown obscurely puberulous scaly bark, innovations ferruginous-pubescent. *Leaves* opposite, thickly coriaceous, glabrous; ovate-lanceolate, acuminate at apex, rounded or acute at base; when fresh dark green above, brownish-green beneath, both surfaces nearly black when dry and minutely impressed-punctate through contraction of the tissues; 5—15 cm. long, 2—6 cm. broad; midrib thick, main nerves about 4—6 pairs rarely at all visible; petiole none or up to 7 mm. long, thick. *Flowers* pale yellow, minute, sessile, clustered on a thickened cushion-like peduncle, 6—20 in each cluster, the clusters in opposite pairs in the axils of the leaves or in whorls at intervals along the internodes; bract scale-like. *Calyx* tubular, rusty-pubescent, 2 mm. long, the limb very faintly toothed. *Petals* 4, free, linear-oblong, thick, puberulous, 4 mm. long. *Stamens* minute, inserted above the middle of the petals; anthers 1 mm. long, filaments as long. *Ovary* globose; style very short; stigma cylindric, papillose, 3 mm. long, obtuse and obscurely 4-lobed at apex. *Fruit* brown, ellipsoid, 4—5 mm. long, puberulous, tipped with the remains of the calyx-limb. *King* in Journ. As. Soc. Beng. LVI. ii. 90. *Baratranthus Lobbii*, *Kingii*, *Scortechinii*, *bicolor*, van Tiegh. in Bull. Soc. Bot. Fr. XLI. 537.

KEDAH: on Kedah peak, *Ridley* 5486!. PENANG: *Lobb* 338!; *Maingay* K.D. 695/2!; at 600—750 m. alt., *King's Collector* 1318!, 1695!; on Government Hill, *Curtis* 85!; 389!; Balik Pulau Road,



Ridley 8020!; on Penang hill, Ridley 10183!. PERAK: on trees on the hills about Larut, Goping, etc., up to 1500 m. alt., King's Collector 2643!, 4486!, 5011!, 6294!, 8061!, 11024!; *Scortechinii*!; at lower camp and to the summit of Gunong Batu Putih, 1000—2000 m. alt., Wray 357!, 933!, 1018!, 2521!; at Gunong Hijan, Ridley 2969!. SELANGOR: at Samangko Pass, Ridley, 2058!. PAHANG: at Tahan river, Ridley 2251!; at Gunong Tahan, Wray & Robinson 5485!; Ridley 16095!. JOHORE: at Kukub, Ridley 13261!. SINGAPORE: at Changi and Chanchukang, Ridley!.

Van Tieghem in his paper in the Bulletin of the Société Botanique de France, Vol. XLI. 533 entitled 'Quelques compléments à l'étude des Loranthées à calice dialysépale et anthères basifixes' has expressed the opinion that there are four species distinct from each other in the material arranged and distributed by Sir G. King after writing his paper on the species of *Loranthus* indigenous in Perak. They are thus characterized and separated:

- |  |         |   |
|--|---------|---|
| Leaves sessile . . . . .   | .. .. . | 1. <i>Baratranthus Lobbii</i> .   |
| Leaves petiolate, broad, often unequal-sided, their surfaces similar, their lateral nerves visible even on the upper surface .. .. . | .. .. . | 2. <i>Baratranthus Kingii</i><br>(King's Collector 2643, 6294).           |
| Leaves petiolate, their surfaces similar, their lateral nerves not visible .. .. .   | .. .. . | 3. <i>Baratranthus Scortechinii</i><br>( <i>Scortechinii</i> —no number). |
| Leaves petiolate, their surfaces dissimilar the lower being reddish yellow .. .. .   | .. .. . | 4. <i>Baratranthus bicolor</i><br>(King's Collector 4486, 11024).         |

The question of absence of petiole in *L. Lobbii* is not borne out by the specimens quoted by Hooker in the Fl. Br. Ind., for both Maingay's and Curtis' specimens show short petioles. The other characters quoted do not seem to be constant so I prefer to leave the material as sorted by Sir George King and not to attempt a subdivision which I do not myself believe to be warranted.

8. *LORANTHUS OBTECTUS*, Wall. Cat. 534 (1828). A parasitic shrub with slender pendulous branches; branchlets slender, terete, greyish-brown, shining, with small raised lenticels, uppermost with innovations and inflorescencè thickly covered with a tomentum of rusty-red, mossy, jointed hairs. *Leaves* chartaceous, opposite or sub-opposite; ovate-lanceolate or elliptic-oblong, obtusely acute at apex, rounded or cordate at base; both surfaces blackish-brown when dry, upper smooth, glabrous when mature, lower also glabrous except the midrib when old, thickly rusty-tomentose when young; 3—8 cm. long, 1.5—5 cm. broad; midrib slender, main nerves 7—8 pairs, irregular, joined in arches towards the margin; reticulation fairly

prominent in a dry state; petiole rather thick, 4—5 mm. long, tomentose. *Flowers* in axillary fascicles, single or in short few-flowered racemes about as long as the petiole, densely mossy-tomentose; pedicels short; bract ovate, obtuse, 1—2 mm. long, clasping the base of the calyx tube. *Calyx*-tube obovoid, 5—6 mm. long; limb stout, constricted at the mouth. *Corolla*-tube in bud slender, curved, clavate, the tip obtuse, 10—12 mm. long, when open cleft about halfway down on one side; lobes 4, short, obtuse, thick. *Stamens* 4; anthers 1 mm. long, apiculate; filaments as long or slightly longer, flat. *Ovary* obovoid; style slender, 4-angled; stigma scarcely capitate. *Fruit* pyriform, the stalk gradually attenuate downwards, the mouth contracted, about 1 cm. long. DC. Prodr. IV. 299. *L. Scurrula*, L. var. *obtecta*, Kurz For. Fl. II. 319; Hook. f. Fl. Br. Ind. V. 209. *L. Scurrula*, L. var. *laevigata*, Hook. f. l.c. *Dendrophthoe obtectus*, G. Don Gen. Syst. III. 419.

TRANG: on branches of trees on low ground, *King's Collector* (*Kunstler*) 1418!. PERAK: Maxwell's hill, 1500 m. alt., *Fox* 120!. MALACCA: *Griffith* K. D. 2733!, 2735!; at Bukit Senggeh, *Goodenough* 1833!. JOHORE: at Kota Tinggi, etc., *Ridley* 4212!, 11031!.—  
DISTRIB. Burma.

The Malay *L. obtectus*, Wall., seems to me to be distinct from the Indian *L. Scurrula* so I have thought it best to retain Wallich's name instead of describing the material under *L. Scurrula* var. *obtecta* as is done in the Fl. Br. Ind. It comes very near *L. Schultesii*, Blume of Java. I have carefully examined the original specimens of *L. Scurrula*, Linn. Sp. Pl. Ed. II. 472 now in the possession of the Linnean Society, and consider that the Malay specimens now under consideration do not agree with it. The leaves have a different shape, the flowers are rather larger and the fruit is less truncate while all the parts are more conspicuously tomentose.

9. LORANTHUS FERRUGINEUS, Roxb. Fl. Ind. ed. Carey & Wall. II. 207 (1824). A parasitic shrub with long pendulous branches; branchlets terete, moderately slender, the bark greyish-brown, minutely lenticellate, uppermost parts, like the under surface of the leaves, the innovations and the inflorescence covered with dense ferruginous mossy tomentum of jointed squarrose hairs. *Leaves* opposite or sub-opposite, coriaceous; uniform in shape, elliptic, very obtusely acute at apex, rounded at base; upper surface dark brown or black when dry; 4—10 cm. long, 2—6 cm. broad; midrib slender, often zigzag; main nerves 5—8 pairs, irregular, branching and joined in loops towards the margin; reticulation obscure; petiole 7—8 mm. long, rough, channelled above. *Flowers* in axillary fascicles of few-

(2—6-) flowered cymes as long as or slightly longer than the petioles; pedicels slender, short; bract ovate embracing the base of the turbinate calyx-tube. *Calyx*-tube 4—5 mm. long, limb short, ciliate. *Corolla* variable in length, 10—20 mm. long, in bud clavate, when open cleft on one side half way down, green or grey inside; lobes 4, obtuse, glabrous within. *Stamens* 4, anthers oblong, 1—1.5 mm. long; filaments broad, 1.5—2.5 mm. long. *Ovary* cylindrical; style slender, 4-angled, slightly bent near the top; stigma subrotund. *Fruit* ovoid-pyriform, densely mossy-tomentose, truncate at top Roxb. Fl. Ind. I. 551 and II. 188 (*ferruginosus*); DC. Prodr. IV. 299; Wall. Cat. 500; Jack in Mal. Misc. I. 9 and in Hook. Bot. Misc. I. 279, t. 59; Hook. f. Fl. Br. Ind. V. 210; King in Journ. As. Soc. Beng. LVI. ii. 92; Koord. Exkurs. Fl. Jav. II. 159. *Dendrophthoe ferruginea*, G. Don Gen. Syst. III. 420; Miq. Fl. Ind. Bat. I. i. 812. *Cichlanthus ferrugineus*, van Tiegh. in Bull. Soc. Bot. Fr. XLII. 253.

PENANG: *Wallich* 500!; *Phillips*!; at Waterfall, *Curtis* 2640!, *G. King*!; *Kurz*!; Penang Hill, *Ridley* 10782, etc.!; *John Scott*!; *Deschamps*!. PERAK: at Changkat Serdang, *Wray* 745!; *Scortechini* 22!, 630!, 2099!. PAHANG: at Katapong, near Pekan, *Ridley* 1234!. MALACCA: *Griffith* K. D. 2727!; *Maingay* K. D. 686; *Cuming* 2257!; *Hervey*!; *Hullett* 399!; *Ridley* 10755!. SINGAPORE: *King's Collector* 1139!; *Ridley*!; *Murton* 137!.—DISTRIB. Java, Sumatra.

10. LORANTHUS MALACCENSIS, Hook. f. in Fl. Br. Ind. V. 210 (1886). A parasitic shrub reaching 60—90 cm. in height; branchlets brownish-grey, terete, closely lenticellate with small pale rounded lenticels, uppermost slender, scurfily rusty-pubescent. *Leaves* thinly coriaceous, opposite or subopposite; elliptic or ovate-elliptic, obtusely acute at apex as at base; both surfaces dark brown when dry, almost shining above, puberulous when young, glabrous when old except the midrib; 3—6 cm. long, 2—4 cm. broad; midrib slender, rusty-pubescent; main nerves 4—6 pairs, irregular, meeting in arches towards the margin, reticulation otherwise obscure; petiole slender, rusty-puberulous, 6—10 mm. long. *Flowers* in axillary few- (about 5-) flowered rusty-pubescent cymes as long as the petiole; pedicels short, slender; bract ovate, minute, 1 cm. or more below the base of the *calyx*-tube which is pyriform and 2—3 mm. long, the limb truncate, contracted. *Corolla* brown in bud, slender, clavate, 10—11 mm. long, when open one side split about half way down; lobes 4, acute, short. *Stamens* 4, anthers oblong, .5—1 mm. long, shortly apiculate; filaments rather longer. *Ovary* ovoid; style slender, 4-

sided, stigma subcapitate. *Fruit* reddish-brown, obconic, rather abruptly contracted into a slender stalk, scurfily rusty-pubescent, about 8 mm. long in all. King in Journ. As. Soc. Beng. LVI. ii. 93.

PENANG: on tree-branches at 600—750 m. alt., *King's Collector* (*Kunstler*) 1308!. PERAK: on high trees at 900—1200 m. alt., *King's Collector* 6286!; *Scortechini* 311!; 647! SELANGOR: at Ginting-Bidai, *Ridley*! PAHANG: at Katapong, *Ridley* 1232!. MALACCA: *Griffith* 2711!

11. LORANTHUS ESTIPITATUS, Stapf in Trans. Linn. Soc. Ser. 2 IV. 221 (1894). A parasitic shrub; branchlets slender, brown, rough with many small circular whitish lenticels, uppermost and innovations rusty and scurfily pubescent. *Leaves* thinly subcoriaceous, subopposite; elliptic or suborbicular, obtuse or emarginate at apex, shortly cuneate at base; upper surface glabrous, lower glabrous when old, when young densely rufous-tomentose; 3.5—5.5 cm. long, 2.5—5 cm. broad; midrib slender, main nerves 3—4 pairs, irregular, meeting in arches near the margin; reticulation obscure; petiole slender, 8—10 mm. long. *Flowers* in an umbellate cyme in pairs or threes on a common slender peduncle 8—10 mm. long, single or fascicled in the axils of the leaves, rufous-tomentose as the whole inflorescence; pedicels slender, 7 mm. long; bract very small, ovate, embracing the calyx-tube. *Calyx* ovoid or nearly globose; limb very short, ciliolate. *Corolla*-tube in bud very slender, curved, clavate, 10—24 mm. long, glabrous within, the tip ovoid, when open cleft into 4 lobes, one of the clefts extending about to the middle of the tube. *Stamens* inserted near the top of the tube; filaments adnate to the tube below, free only for about 1 cm.; anthers oblong, 2—2.5 mm. long, obtuse, cells transversely septate. *Ovary* included in the calyx-tube; style very slender, 4-angled, stigma clavate. *Fruit* oblong, 7 mm. long, 4 mm. in diam., glabrous, prominently rugose, not stalked.

PERAK: *Scortechini* 421!, at Gunong Haram 647!.—DISTRIB. Borneo (*Fraser* 183!; Kinabalu Mt. *Haviland* 1351!).

*Scortechini* 421 was identified by Sir George King with *L. Scurrula*, L. var. *obtecta*, but Dr. O. Stapf in his paper on the Flora of Kinabalu in Borneo, rightly pointed out that the fruit is quite different, being oblong and not clavate. He, like Sir G. King, makes *Scortechini* 311 the same, but that specimen seems to me to differ very much and to belong to *L. malaccensis*.

12. LORANTHUS CASUARINÆ, Ridley in Trans. Linn. Soc. 2nd Ser. III. 342 (1893). A parasitic shrub; branchlets stout, smooth, with

dark brown lenticellate bark, the younger ones and other parts covered with a rusty orange-coloured (when fresh) tomentum. *Leaves* fleshy, opposite; ovate-lanceolate, acuminate at apex, rounded or subcordate at base; upper surface glabrous, lower covered with a rusty tomentum; 8—13 cm. long, 4—5 cm. broad; midrib stout, raised on both surfaces; main nerves about 5—6 pairs, very obscure as is the reticulation; petiole 5—6 mm. long. *Flowers* in axillary racemes about 2.5 cm. long, covered with a ferruginous tomentum of branched multicellular hairs; bract lanceolate, acuminate, 12 mm. long. *Calyx*-tube short, cylindric, somewhat compressed in the middle, limb scarcely any. *Corolla*-tube curved, narrowed a little above the base then dilated and again slightly narrowed below the mouth, 4 cm. long, cleft on one side to about the middle, glabrous within; lobes 5, linear, curved, 10—12 mm. long. *Stamens* 5; anthers linear, apiculate, 3—4 mm. long; filaments slender, 5 mm. long. *Ovary* ovoid; style slender, longer than the stamens; stigma subclavate. *Fruit* (immature) lageniform, densely rusty tomentose without, 8—10 mm. long.

PAHANG: on *Casuarina equisetifolia*, Forst, at Sungei Meang. Ridley 1526!.

13. LORANTHUS CRASSUS, Hook. f. in Fl. Br. Ind. V. 217 (1886). A parasitic shrub; branchlets stout, the younger ones with smooth grey bark and few lenticels, the older ones rough with many lenticels; nodes swollen. *Leaves* very thickly coriaceous, opposite subopposite or alternate, very variable in shape; elliptic, ovate-oblong or oblong-lanceolate, sometimes nearly orbicular, obtusely acute at apex, rounded or attenuate at base; both surfaces dark brown and opaque when dry; 8—18 cm. long, 4—10 cm. broad; midrib very stout especially at base, raised on both surfaces; main nerves irregular, 5—6 pairs, distinct when dry, curving upwards to disappear near the margin; reticulation not visible; petiole very stout, 5—7 mm. long. *Flowers* in axillary racemes up to 12 mm. long; the racemes about 5—6-flowered, densely furfuraceous; pedicels very short, stout; bracts ovate, acute, 1—2 mm. long. *Calyx*-tube globose or urceolate, the limb truncate, faintly lobed. *Corolla* straight, funnel-shaped, not or only very slightly split on one side, 17—18 mm. long, equally cleft to a little below the middle into 5 linear lobes, reflexed for half their length. *Stamens* 5; anthers linear, 2—3.5 mm. long, as long as the stellately puberulous filaments. *Ovary* ovoid; style slender, nearly as long as the corolla-lobes; stigma large, capitate.

*Fruit* ovoid-oblong, 8—10 mm. long, puberulous without, crowned by the cupular persistent calyx-limb. Ridley in Journ. Str. Br. R. As. Soc. LIX. 165. *L. retusus*, Wall. Cat. 504, in part only.

KEDAH: Lankawi island *Curtis* 2641! Vern. 'Bendalu apia'; on *Dacrydium*, the leaves red, Gunong Jerai, *Ridley*. SINGAPORE: *Wallich* 504! (in part only); at Changi, *Ridley* 1933!; in gardens *Ridley* 8064!, 8901; at Bukit Mandi, *Ridley*!

14. LORANTHUS PENTANDRUS Linn. Mant. 63 (1767). A parasitic shrub, reaching a considerable size even to 3—4 m. in height, branches stout; branchlets rather stout, terete, grey, shining, uppermost puberulous. *Leaves* thickly coriaceous, subopposite, or alternate; variable in shape, lanceolate or ovate-elliptic to nearly orbicular, obtuse to acute at apex, broadly attenuate to cuneate at base; both surfaces glabrous, dark brown or almost black when dry; 5—15 cm. long, 3—10 cm. broad; midrib stout, prominent, wavy; main nerves 3—5 pairs, faint; reticulation not visible; petiole stout, 6—10 mm. long, bordered above by the decurrent margins of the blade. *Flowers* in axillary, sometimes fascicled, scurfy, grey-pubescent racemes reaching 2—3 cm. long; rachis slender, stellately pubescent as are the calyx, corolla and filaments; pedicels short, slender; bract ovate, acute, 2 mm. long, embracing half the base of the calyx-tube. *Calyx-tube* ovoid or urceolate, 3 mm. long, densely grey-tomentose; limb shortly 5-toothed. *Corolla* in bud cylindric above, ventricose at base, puberulous, 15—20 mm. long; when open cleft two-thirds of the way down into 5 equal linear acute lobes which are reflexed at their middle; greenish outside, yellow or orange within. *Stamens* 5, erect, nearly as long as the corolla lobes; anthers linear, obtuse at apex, 2 mm. long; filaments flat, 5 mm. long, sparsely stellate-farinoso. *Ovary* ovoid; style rather thick, angled; stigma capitate. *Fruit* ovoid, 8—10 mm. long, contracted and crowned at the top by the persistent calyx-limb, at first farinose at length glabrous; cotyledons pointed. DC. Prodr. IV 305; Bl. Bijdr. 661; Kurz For. Fl. II. 320; Blume Fl. Jav. Loranth. 33, t. 10; Korth. Verh. Lor. 80; Hook. f. Fl. Br. Ind. V. 216; King in Journ. As. Soc. Beng., LVI, ii. 93; Prain Beng. Plants 911; Koord. Exkurs. Fl. Jav. II. 159. *L. farinosus*, Desr. in Lamk. Encyc. III. 597; Roxb. Fl. Ind. ed. Carey & Wall. II. 221; Wall. Cat. 514; Griff. Notul. IV. 616 and Ic. Pl. Asiat. t. 620, f. 1, 2; *L. rigidus*, *contractus* and *Finlaysonianus*, Wall. Cat. 531, 6864, 6871. *L. maculatus* and *venosus* Bl. Bijdr. 662. *Dendrophthoe pentandra* and *farinosa*, Miq. Fl. Ind. Bat.

I. i. 818, 819; van Tiegh. in Bull. Soc. Bot. Fr. XLII, 252. *Scurrula pentandra* G. Don Gen. Syst. III, 424. *Elytranthe farinosa*, G. Don Gen. Syst. VI, 427.

SIAMESE STATES: Setul, *Ridley* 14921!; Trang at 30—60 m. alt., *King's Collector* 1411!. PENANG AND SINGAPORE: *Wallich* 514A!. PENANG: on various trees at 150—300 m. alt., *King's Collector* 1299!; on *Eugenia Jambos*, Penang Hill, *G. King*!; at Penara Bukit, *Curtis* 476!; *Phillips*!. PROVINCE WELLESLEY: *King's Collector* 1613!. PERAK: at Gunong Haram, etc., *Scortechini* 22!, 605!; at Waterfall, Gunong Inas, etc., *Wray* 1267!, 1839!, 1903!, 2062!, 4085!; on tree-branches at Larut, etc., *King's Collector* 4931!, 7538!, 7767!; at Pangkor, *Ridley* 8032!. PAHANG: on *Hibiscus tiliaceus*, Sungei Meang, *Ridley* 1534!. MALACCA: *Maingay* K.D. 685!, 687!; *Cuming* 2363! SINGAPORE: *Lobb* 293!; *Hullett* 345!; *King's Collector* 1164!; *Deschamps*!; at Changi, *Ridley* 1930!; on trees in Bot. Garden, *Ridley* 6817!, 8901!.—DISTRIB. India (E. Bengal), Burma, Siam, Sumatra, Java, Borneo.

15. LORANTHUS LONGIFLORUS Desr. in Lamk. Encycl. III 598 (1789). A large parasitic glabrous shrub; branches stout, marked by prominent pale lenticels on a grey smooth bark; branchlets terete, smooth, the nodes swollen. *Leaves* coriaceous, opposite or alternate, very variable in shape; oval, oblong or elliptic, obtuse at apex, attenuate or rounded at base; both surfaces dull, olive brown when dry; 9—15 cm. long, 4—7 cm. broad; midrib very stout at base but quickly narrowing, prominent; main nerves very irregular, about 6—10 pairs, much branched, and joined by irregular transverse nervules; reticulation obscure; petiole stout, 0—1 cm. long. *Racemes* axillary or from the axils of fallen leaves or from 1—2-year old wood, solitary or fascicled, inserted in a shallow cup-like involucre, 4—7 cm. long, many-flowered, usually upcurved with upcurving flowers; pedicels 4 mm. long, slender; bract cupular, acuminate on the upper side and embracing the calyx-tube. *Calyx*-tube short; limb cup-shaped, entire or minutely denticulate. *Corolla* pink or red, often with green lobes; buds 4—4.5 cm. long, curved, gradually enlarging upwards and clavate at tip; when open the tube 3 cm. long, cleft above in 5 lobes which are reflexed for 1—1.5 cm. long, one or two clefts often deeper than the rest. *Stamens* 5; anthers narrow, 12 mm. long, the filaments equal or shorter. *Ovary* sunk in the calyx-tube; style as long as the corolla-lobes; stigma capitate. *Fruit* oblong, smooth or dotted, 1—1.5 cm. long, crowned by the

cupular calyx-limb. DC. Prodr. IV, 304; Roxb. Fl. Ind. Ed. Carey and Wall. II, 217; Wight & Arn. Prodr. iv. 384; Dalz. & Gibs. Bomb. Fl. 110; Brandis For. Fl. 397 and Ind. Trees 549; Kurz For. Fl. II. 321; Wall. Cat. 507; Wight Ic. t. 302; Hook. f. Fl. Br. Ind. V. 214; Trimen Fl. Ceyl. III, 468; Cooke Fl. Bomb. II. 548; Prain Beng. Plants 910. *L. bicolor*, Roxb. Corom. Pl. II. 20 t. 139; Fl. Ind. I. 548, II. 185; Wall. Cat. 499. *L. Wightianus*, Wall. Cat. 6872. *Dendrophthoe longiflorus*, van Tiegh. in Bull. Soc. Bot. Fr. XLII. 252. *Scurrula longiflora*, G. Don Gen. Syst. III, 423. 'Valli-ithi-cauni' Rheede Hort. Mal. X. 5, t. 4.

MALACCA: Griffith 1710!.—DISTRIB. India, Burma, Ceylon.

16. LORANTHUS GRANDIFRONS, King in Journ. As. Soc. Beng. LVI, ii, 93 (1887). A parasitic shrub reaching 90—120 cm. in height; branches stout with dark greyish-brown roughly lenticellate bark; branchlets terete, rather slender, little swollen at the nodes; dark-brown. *Leaves* alternate or sub-opposite or rarely opposite, thickly coriaceous; broadly ovate or lanceolate, acute or acuminate at apex, rounded or cordate at base; both surfaces dull, sparsely pulverulent, upper often bullate, dark brown when dry; margin recurved; 12—27 cm. long, 6—16 cm. broad; midrib very stout, slightly raised above, very prominent beneath; main nerves 4—6 pairs, prominent, especially on the lower surface, the lower pairs from near the base, the others distant, all curving upwards and joined in loops towards the margin; secondary nerves and transverse nervules also prominent beneath; petiole very stout, 1.5—3 cm. long. *Flowers* in racemes from the axils of the leaves or of fallen leaves; the racemes 6—10 cm. long, densely covered with grey pulverulent sub-deciduous more or less stellate tomentum, erect or curved, about 30-flowered; pedicels short, about 3 mm. long, thick; bract small, ovate, acute, embracing the base of the calyx-tube. *Calyx-tube* cylindric, inflated at base, 3—5 mm. long; limb 5—6 toothed. *Corolla-tube* cylindric, slender, base whitish, upper parts pink, 6—8 cm. long, curved, 5-ribbed, more or less inflated above the middle; lobes 5, red within, nearly 2 cm. long, the upper 1 cm. reflexed, linear. *Stamens* 5, exsert; anthers linear, flattened, obtuse, 5—3 mm. long; filaments flat, 4 mm. long, stellate-pulverulent. *Ovary* ovoid; style filiform, angular, slightly longer than the stamens; stigma subglobose. *Fruit* ovoid, thickly grey-pulverulent, crowned by the persistent calyx-limb, 8 mm. long, 6 mm. in diam.



SIAMESE STATES: Pongah and Kasum, *Curtis* 3266!. PERAK: at Hulu Kwansa, *Scortechini* 926!; at Kota and Matang Sambu *Wray* 1958!, 2517!; on the branches of trees near Kinta river and Larut, *King's Collector* 786!, 2067!. NEGRI SEMBILAN: at Seremban, *Ridley* 10023!. PAHANG: at Tulom Alaty, on *Vitex vestita*, etc., *Ridley* 2248!. SELANGOR: at Kwala Lumpur, *Ridley's Collector*!. MALACCA: at Batang Malaka, *Derry* 1156! Vern. 'Mendalu hesar.'—DISTRIB. Sumatra (*Forbes* 1665!, on trees by the edge of heavy forest in Lampongs).

17. LORANTHUS SCORTECHINII, King in Journ. As. Soc. Beng. LVI. ii. 94 (1887). A parasitic shrub reaching 60—90 cm. in height; branches stout with smooth shining reddish-brown bark; branchlets thick, terete, smooth, the uppermost pale and angular. *Leaves* coriaceous, in verticils of about 6; elliptic-oblong or oblong-lanceolate, abruptly caudate-acuminate at apex, attenuate at base; both surfaces dark green when fresh, dark olive brown and dull when dry and then minutely wrinkled; margin recurved; 18—25 cm. long, 6—10 cm. broad; midrib very stout, very prominent on both surfaces and minutely wrinkled; main nerves about 15 pairs, invisible in fresh, obscure in dry, specimens, sub-horizontal; petiole very stout, 2—6 cm. long, narrowly winged by the decurrent margins of the blade. *Flowers* numerous, crowded, in short racemes scarcely 4—6 cm. long, at most, from the old wood; rhachis very stout, woody, pitted; pedicels very short, stout; bract ovate, acute, 2 mm. long, embracing the base of the calyx-tube. *Calyx*-tube cylindric, 5 mm. long, limb irregularly dentate. *Corolla* pale yellow, the lobes tinged with green; tube glabrous, cylindric at base, gradually expanded in a slender curved funnel, 10 cm. long; lobes 6, linear, 3 cm. long, the upper 2 cm. recurved in flower. *Stamens* 6; anthers linear, acute, 8—10 mm. long; filaments slender, as long as anthers. *Ovary* cylindric; style filiform, as long as the stamens; stigma red, globose. *Fruit* not seen. *Kingella Scortechinii*, van Tiegh. in Bull. Soc. Bot. Fr. XLII. 250.

PERAK: at Gunong Haram, etc., *Scortechini* 90!, 702!; on branches of large trees near Goping at 90—240 m., *King's Collector* 6020!.

18. LORANTHUS DUTHIEANUS, King in Journ. As. Soc. Beng. LVI. ii. 94 (1887). A parasitic shrub; branches stout; branchlets terete, sparsely lenticellate with pale pinkish-brown bark, uppermost

slender, angular when dry, glabrous. *Leaves* coriaceous, alternate, opposite or in verticils of 3 together; elliptic-oblong or elliptic-lanceolate, obtusely acute at apex, attenuate at base; both surfaces glabrous, greyish-green when dry, 5—8 cm. long, 2—3 cm. broad; midrib slender, raised on both surfaces; main nerves invisible in fresh, rather prominent in dry, specimens, 3—5 pairs, irregular, very oblique, curving to anastomose near the margin in an areolate reticulation; petiole 1 cm. long, rather stout. *Flowers* in slender racemes from the axils of the leaves or of fallen leaves, reaching 1—5 cm. in length and about 6-flowered; rhachis, pedicels and bracts minutely puberulous; pedicels 3—4 mm. long; outer bract small, ovate, acute, embracing a pair of flowers each of which is supported by a shallow cup-shaped bracteole. *Calyx*-tube cylindric, 3—4 mm. long; the limb short, truncate, waved at the margin. *Corolla* tubular, glabrous, bright red, curved, inflated upwards and constricted at the neck in bud, 4—5 cm. long; lobes 6, linear, subspathulate, 8—10 mm. long, eventually reflexed. *Stamens* 6; anthers oblong, 2 mm. long, filaments about 4 mm. long, slender. *Ovary* cylindric, surmounted by a thickened cushion from which springs the filiform style, as long as the stamens; stigma globose. *Fruit* not seen. *Arculus Duthieanus*, van Tiegh. in Bull. Soc. Bot. Fr. XLII. 445.

PERAK: *Scortechini*!. SINGAPORE: at Bukit Timah, *Ridley*!.

van Tieghem makes this a separate genus nearer to *Elytranthe* than to *Loranthus*. I do not find the two bracteoles to each flower that he discovered, but there certainly is one. I prefer to retain *Arculus* in *Loranthus*, but it certainly is different from the rest of the genus.

## 2. LOXANTHERA, Blume.

Parasitic shrubs. *Leaves* coriaceous, entire, exstipulate, opposite or alternate. *Flowers* in short cymes from the axils of the leaves or of fallen leaves; bract ovate, very small, embracing the base of the calyx-tube. *Calyx*-tube cylindric; limb cupular, irregularly cleft. *Corolla*-tube very long, contracted a little above the base and again above the insertion of the filaments; lobes 6, linear-spathulate, reflexed in flower. *Stamens* 6; filaments slender, arched at the top and broadening into the back of the connective rather below its middle; anthers linear, cells 2, parallel. *Ovary* cylindric; style filiform; stigma clavate. *Fruit* of *Loranthus*, etc.—DISTRIB. Two species, in the Malay Peninsula and Archipelago.

1. *LOXANTHERA SPECIOSA*, Blume & Fisch. Fl. Jav. Lor. 11. tt. 20 and 23 C (1828?) A parasitic shrub; branchlets terete, smooth, moderately stout, uppermost sub-compressed. *Leaves* opposite or sub-opposite, coriaceous; ovate or elliptic-ovate, acute or obtuse, sometimes retuse, at apex, attenuate, more or less unequally, at base; both surfaces smooth, glabrous, olive-brown when dry; 8—12 cm. long, 4—6 cm. broad; midrib fairly prominent, dark; main nerves 6—8 pairs, very obscure as is the reticulation; petiole stout, 1—1.5 cm. long. *Flowers* in axillary or sub-terminal, few-flowered, puberulous cymes 2—3 cm. long, the joints very fragile; pedicels stout, 5—8 mm. long; bract very small, ovate, embracing half the base of the calyx-tube. *Calyx*-tube cylindric, 4 mm. long, limb expanded in a cupula 2 mm. long, dentate on the margin. *Corolla*-tube red without, yellow within, curved, in bud 10—12 cm. long, narrowly funnel-shaped to the insertion of the stamens and then constricted, clavate at apex, when open divided into 6 lobes narrowed at the base, spatulate above and circinate twisted, about 4 cm. long. *Stamens* 6; filaments 3 cm. long, curved and thickened at apex in a right angle; anthers attached a little below the middle, hooked at top and bottom, 7 mm. long. *Ovary* cylindric; style filiform; stigma red, clavate. *Fruit* not seen. G. Don Gen. Syst. III. 430; Miq. Fl. Ind. Bat. I. i. 822; van Tiegh. Bull. Soc. Bot. Fr. XLII. 448; Koord. Exkurs. Fl. Jav. II. 166. *Loranthus Loxantherus*, DC. Prodr. IV. 316. *L. coccineus*, Reinw. MS. (not of Jack); Bl. Bijdr. 664. *L. Reinwardtianus*, Schult. Syst. VII. 105; DC. Prodr. iv. 306. *L. speciosus*, King in Journ. As. Soc. Beng. LVI. ii. 95. non Bl.

PERAK: *Scortechini* 1328!; on a tree on the banks of the Kinta river, *King's Collector* 767!. MALACCA: *Griffith* K.D. 2716!. JOHORE: Muar river bank, *Curtis* 3661!.—DISTRIB. Java, Sumatra (*Forbes* 3234!), Borneo (near Kuching, *Haviland*!)

### 3. *ELYTRANTHE*, Blume (amplified).

Parasitic shrubs. *Leaves* opposite or subopposite, more or less coriaceous, entire, exstipulate. *Flowers* few, in spikes, racemes or pairs with one bract and two bracteoles which may be free or combined in a cup. *Calyx*-tube cylindric, the limb small, truncate. *Corolla*-tube usually entire, more or less cylindric or funnel-shaped, lobes 5 or 6, usually 6, equal, reflexed in flower. *Stamens* 5—6, anthers basifixed. *Ovary* enclosed in the calyx-tube, style slender, stigma

usually capitate. *Fruit* as in *Loranthus*.—DISTRIB. India, Malaya, Polynesia and New Zealand.

Flowers in spikes; bract and 2 free bracteoles large, longer than the calyx-tube (Sect. I. *EUELYTRANTHE*).

All parts glabrous; leaves ovate or oblong, obtuse; bract and bracteoles obtuse, 6—7 mm. long; corolla-tube white .. .. . 1. *E. albida*.

Most parts scurfily rusty-puberulous; leaves elliptic or obovate, obtuse; bract obtuse, 10—12 mm. long, bracteoles acute, 9—10 mm. long .. .. . 2. *E. Maingayi*.

Flowers in racemes; bract and bracteoles shorter than the calyx-tube, the latter free or combined in a cup (Sect II. *MACROSOLEN*).

Corolla-tube more than 4 cm. long

Leaves more or less ovate, acuminate at apex—

Leaves under 16 cm. long, 6 cm. broad; corolla-tube 4—6 cm. long, crimson, the lobes green with purple tips .. .. . 3. *E. formosa*.

Leaves over 15 cm. long, 6 cm. broad; corolla-tube 5—6 cm. long, bright yellow, the lobes green outside, red within .. .. . 4. *E. Kunstleri*.

Leaves more or less orbicular, cordate at base; corolla-tube 8—9 cm. long, red .. .. . 5. *E. platyphylla*.

Corolla-tube 2—3 cm. long, red; leaves lanceolate, 7—10 cm. long, under 5 cm. broad .. .. . 6. *E. aensis*.

Corolla-tube under 2 cm. long

Calyx-tube and corolla-lobes prominently papillose without; racemes of 2 flowers; leaves oblanceolate .. .. . 7. *E. papillosa*.

Calyx-tube and corolla-lobes not papillose; racemes rather slender with more than 2 flowers, the flowers clavate in bud, more or less funnel-shaped in flower.

Leaves obovate, usually retuse at apex .. .. . 8. *E. retusa*.

Leaves ovate or lanceolate, usually acute at apex.

Pedicels, bract and bracteoles puberulous; ovary cylindrical .. .. . 9. *E. Lowii*.

Pedicels, bract and bracteoles glabrous; ovary globose .. .. . 10. *E. globosa*.

Corolla-tube under 1 cm. long.

Leaves lanceolate or oblong lanceolate, over 2.5 cm. broad, obtusely acuminate; racemes clustered, 4—5-flowered, 12—15 mm. long .. .. . 11. *E. Barnesii*.

Leaves lanceolate, under 2.5 cm. broad, acuminate; racemes in nearly sessile fascicles, 1—3-flowered, scarcely 5 mm. long .. .. . 12. *E. Robinsonii*.

Flowers in pairs in the excavations of a thick peduncle; bract moderately large, bracteoles combined in a trun-

cate cup cleft opposite the bract, shorter than the calyx-tube (Sect. III. BLUMELLA).

- Bract 2 mm. long, bracteole cup 2—3 mm. long; leaves thinly coriaceous, lanceolate, acuminate at apex, rounded or shortly attenuate at base; corolla-tube deep red, lobes green with purple margins .. 13. *E. diantha*.
- Bract 3—4 mm. long, bracteole-cup about 3 mm. long; leaves thickly coriaceous, oblong-lanceolate, obtusely acuminate at apex, attenuate at base; corolla-tube red passing into green, lobes yellow bordered with red .. .. . 14. *E. Wrayi*.

1. ELYTRANTHE ALBIDA, Blume Fl. Jav. t. 22 (1828?) a large parasitic glabrous shrub; branches stout with pale grey bark and prominent nodes; branchlets thick, terete. *Leaves* opposite, chartaceous or subcoriaceous; ovate or oblong, obtuse or obtusely acute at apex, broadly cuneate or attenuate, often unequally, at base; both surfaces dull bluish-green when fresh, greyish brown when dry; 6—12 cm. long, 3—7 cm. broad; midrib moderately stout, prominent on the lower surface, less so on the upper; main nerves 10—12 pairs, irregular, spreading, early-branched, joined by the slender secondary nerves and irregularly areolate reticulation, prominent especially on the lower surface; petiole rather slender, 1—2 cm. long. *Flowers* in 2—6-flowered distichous spikes, single or clustered in the axils of the leaves or of fallen leaves; peduncles stout, about 1 cm. long or longer; rhachis stout, decussately excavated to receive the flowers, usually about 1 cm. long or less; bract boat-shaped, concave, keeled, obtuse, 6—7 mm. long; bracteoles 2, thinner, as long as the bract and produced beyond it. *Calyx*-tube cupular, short, truncate. *Corolla* tube white, constricted above the ovary, then enlarged, curved, 2—3 cm. long; lobes 5—6, slender, bluish without, pale pink within, recurved in flower, 1 cm. long, thickened in a band in the middle within, the tip acute. *Stamens* 5—6; anthers 1—2 mm. long, oblong, apiculate; filaments broad, crimson, 5 mm. long. *Ovary* ovoid, style rather thick; stigma small, capitate. *Fruit* not known. G. Don Gen. Hist. III. 428; Miq. Fl. Ind. Bat. I. i. 832; Engl. & Prantl Naturl. Pflanzenfam. III. i. 189; van Tiegh. Bull. Soc. Bot. Fr. XLII. 439; Koord. Exkurs. Fl. Jav. II. 163. *Loranthus albidus*, Blume Bijdr. 665; DC. Prodr. IV. 299; Korth. Verhand. Loranth. 87; Hook f. Fl. Br. Ind. V. 222; King in Journ. As. Soc. Beng. LVI. ii. 98; Brandis Ind. Trees 551. *L. leucosiphon*, Griff. Notul. IV. 623 and Ic. Pl. Asiat. tt. 619, 621—623.

SIAMESE STATES: Trang, King's Collector 1422!. PENANG:

Government Hill, *Curtis* 1113!. PERAK: at Gunong Haram, *Scortechini* 428!, 626!; at lower camp, Gunong Batu Pateh, about 1000 m. alt., *Wray* 450!. MALACCA: *Griffith* K.D. 2708!; *Maingay* K.D. 693. SINGAPORE: at Bukit Timah, *Ridley* 8042!.—DISTRIB. Java, Sumatra, Borneo.

2. ELYTRANTHE MAINGAYI, Gamble. A parasitic shrub; branchlets terete, moderately stout, scurfily rusty-puberulous, uppermost somewhat flattened; nodes distant, thickened. *Leaves* opposite, coriaceous; elliptic or obovate, obtuse at apex, acute at base; both surfaces dull, rusty-brown when dry, scurfy; 5–8 cm. long, 2–5 cm. broad; midrib moderately stout, nearly black on the lower surface; main nerves slender, obscure, 3–6 pairs; reticulation not visible; petiole stout, 6–12 mm. long, rusty-puberulous. *Flowers* in sessile, axillary, scurfily rusty-pubescent spikes, single or fascicled, about 1–1.5 cm. long; rhachis very stout, decussately excavated to receive the flowers; bract oblong, obtuse, scurfily pubescent, 10–12 mm. long; bracteoles 2, oblong acute, also scurfily pubescent, 9–10 mm. long. *Calyx*-tube rather slender, limb cupular, 2–2.5 mm. long, glabrous. *Corolla*-tube glabrous, at first broad, then constricted, then funnel-shaped, 4 mm. long; lobes 6, linear, acuminate, spreading or recurved, 10 mm. long, thickened within. *Stamens* 6; anthers acuminate, 1–1.5 mm. long; filaments broad, 2–3 mm. long. *Ovary* ovoid; style rather stout; stigma capitate. *Fruit* not known. *Loranthus Maingayi*, Hook f. Fl. Br. Ind. V. 222.

MALACCA; *Maingay* K.D. 694!. SINGAPORE: at Karanji, *Ridley* 6923!.

3. ELYTRANTHE FORMOSA, G. Don Gen. Hist. Dichl. Pl. III. 426 (1834). A parasitic shrub reaching 1.5–2 m. in height, all parts glabrous; branches rounded, pale brown, smooth; branchlets terete, brown, uppermost obscurely angled; nodes swollen. *Leaves* opposite or slightly sub-opposite, coriaceous; ovate or elliptic-ovate or -lanceolate, acuminate and often cuspidate at apex, obtuse rounded or rarely attenuate at base; upper surface shining, somewhat bullate, lower smooth; margins recurved; 10–16 cm. long, 4–6 cm. broad; midrib stout, prominent; main nerves 6–8 pairs, irregular, often obscure, if visible impressed above, somewhat prominent beneath, curving upwards to and along the margin; secondary nerves and reticulation obscure; petiole stout, channelled, about 3–5 mm. long. *Flowers* in few- (3-5-) flowered umbellate cymes from the

axils of the leaves or of fallen leaves; peduncle stout, about 3 mm. long; pedicels 3—4 mm. long; bract ovate, concave, 1—5 mm. long; bracteoles 2, smaller, obtuse or slightly acute. *Calyx*-tube cylindric, the limb obscurely toothed, slightly spreading. *Corolla* tube bright crimson, 4—6 cm. long, curved, gradually inflated above and again constricted at the mouth below the lobes; lobes in bud 6, greenish, the tips purple, obovate, afterwards reflexed and twisted, 1—2 cm. long, thickened in a broad ridge inside. *Stamens* 6; filaments broad, 1 cm. long; anthers linear-oblong, 4 mm. long, minutely apiculate. *Ovary* cylindric; style filiform, geniculate near the top; stigma obtuse. *Fruit* not seen. Engl. & Prantl *Naturl. Pflanzenfam. Nachtr.* 126; Koord. Exkurs. Fl. Jav. II. 164. *Loranthus formosus*, Bl. *Bijdr.* 664 and Fl. Jav. *Loranth.* t. 15; DC. *Prodr.* IV. 297; Kurz *For. Fl.* II. 317; Hook. f. Fl. Br. Ind. V. 220; King in *Journ. As. Soc. Beng.* LVI. ii. 95 *Macrosolen formosus*, Miq. Fl. Ind. Bat. I. i. 827; van Tiegh. in *Bull. Soc. Bot. Fr.* XLI 442.

PERAK: *Scortechini* 392!; at Gunong Batu Putih, lower camp and summit, 1800 m. alt., *Wray* 484!, 873!; on trees at 1000—1200 m. alt., *King's Collector* 2170!, 6264!; at Bujong Malacca, 700—800 m. alt., *Curtis* 3322!.—DISTRIB. Burma (*Griffith* K.D. 2729); Java.

The description has been largely taken from that of *Scortechini*.

4. ELYTRANTHE KUNSTLERI, Gamble. A large parasitic shrub, usually up to 1 m. in height, sometimes reaching 3 metres, all parts glabrous; branches stout, swollen at the nodes, the bark pale brown; branchlets stout, terete, pale. *Leaves* coriaceous, opposite; ovate to ovate-oblong, acuminate at apex, rounded at base; both surfaces shining, somewhat bullate and olive-brown when dry; margins recurved; 15—25 cm. long, 6—12 cm. broad; midrib very stout, prominent on both surfaces; main nerves 6—10 pairs, prominent, impressed above, raised beneath, irregular, curving to disappear a little short of the margin; secondary nerves also prominent, but much shorter, reticulation obscure; petiole 0 or stout and scarcely 3 mm. long. *Flowers* in few- (about 5-) flowered cymes 1—1.5 cm. long, single or clustered in the axils of the leaves or of fallen leaves; peduncle stout, about 5 mm. long; pedicels 5—7 mm. long; bract ovate, acute, 2—3 mm. long; bracteoles smaller, obtuse, all concave. *Calyx*-tube cylindric, smooth, 6 mm. long, the limb truncate, wavy, slightly spreading. *Corolla* clavate and boldly 6-angled in bud;

tube bright yellow, slightly curved, inflated at the base of the limb, 5—6 cm. long; lobes 6, bright green externally, dark red within, reflexed, sub-spathulate, 1.5—2.5 cm. long, broadened below, with a broad thick ridge internally, the tips acute. *Stamens* 6; filaments stout; anthers linear, 7—8 mm. long, obtuse at apex. *Ovary* cylindrical; style slender; stigma truncate. *Fruit* ovoid, 14 mm. long, 8 mm. broad, bright yellow when fresh, black when ripe; seed ovoid, 1 cm. long, sulcate. *Loranthus Kunstleri*, King in Journ. As. Soc. Beng. LVI. ii. 95 (1887). *Macrosolen Kunstleri*, van Tiegh. in Bull. Soc. Bot. Fr. XLII. 442.

PERAK: on trees from sea level up to 250 m. alt. near Larut, Goping and Thaiping, *King's Collector* 2669!, 2760!, 6009!, 8460!. DINDINGS: at Telok Sera, *Ridley* 8030!. PAHANG: Taban river and Kadonding Pulau, *Ridley*!.—DISTRIB. Borneo? (*Haviland*).

5. ELYTRANTHE PLATYPHYLLA, Gamble. A glabrous parasitic shrub; branchlets stout, pale brown, quadrangular. *Leaves* coriaceous, opposite or subopposite; broadly ovate-rotund or suborbicular, obtusely rounded at apex, cordate at base; both surfaces smooth, olive green when dry; margins unequally and remotely crenate or entire; 9—12 cm. long and broad; midrib prominent, thick at base but quickly narrowing; main nerves 4—6 pairs, chiefly from near the base, spreading to anastomose near the margin; reticulation irregularly areolate; petiole very stout, scarcely 2 mm. long. *Flowers* in very short axillary racemes of about 4; bract ovate, acute; bracteoles joined in a hemispheric minutely margined cup. *Calyx*-tube cylindrical, truncate, the limb scarcely lobed. *Corolla* large, curved, tubular, red, expanding slightly upwards, 6-angled and inflated below the apex, the tube 8—9 cm. long; lobes 6, green, 2 cm. long, reflexed, linear-lanceolate or subspathulate, blunt and inflexed at the tips, broadly thick-ridged within, spreading at base. *Stamens* 6; anthers linear, with a minute spur at base, 7 mm. long; filaments thick, 10 mm. long. *Ovary* cylindrical; style filiform; stigma small, subcapitate. *Fruit* not known. *Loranthus platyphyllus*, King in Journ. As. Soc. Beng. LVI. ii. 97 (1887) *not* of Rich.

PERAK: Scortechini 606?!. SELANGOR: at Ginting Bidai, *Ridley* 7618!. JOHORE: at Sungei Hulu Sembrong, *Lake and Kelsall*!

6. ELYTRANTHE AVENIS, G. Don Gen. Syst. Dichl. Pl. III. 426 (1834). A parasitic shrub reaching 1.5 m. in height, glabrous; branchlets angular, moderately stout, with rough scaly reddish-



brown bark; nodes swollen, uppermost internodes compressed. *Leaves* coriaceous, opposite or subopposite: lanceolate, obtusely acute or acuminate at apex, attenuate at base; both surfaces dull, olive green when dry, margins slightly recurved; 7—10 cm. long, 2.5—5 cm. broad; midrib fairly stout, raised on both surfaces; main nerves obscure, if visible when dry 6—10 pairs; reticulation obscure; petiole none or very short, bordered by the decurrent margins of the blade. *Flowers* in short 3-flowered cymes, single or 2—3 or more together in the axils of the leaves or of fallen leaves; peduncle very short, about 1 mm. long; pedicels slender, 4 mm. long; bract ovate, acute, 2 mm. long; bracteoles shorter, rounded, the bract and bracteoles together embracing the calyx-tube. *Calyx*-tube cylindric, 2 mm. long, the limb irregularly 5—6-lobed. *Corolla* tube slender, curved, red, slightly thickened below the limb, 2—3 cm. long; lobes 6, linear, reflexed in flower, thickened, 1.5—2 cm. long. *Stamens* 6; anthers narrowly linear with a slight spur at the base, 4 mm. long; filaments filiform, 8 mm. long. *Ovary* cylindric; style filiform; stigma globose. *Fruit* (immature) ovoid. *E. evenia*, Engl. in Engl. & Prantl Nachtr. 126; Koord. Exkurs. Fl. Jav. II. 164. *Loranthus avenis*, Bl. Bijdr. 663 (1825); DC. Prodr. IV. 297; Korth. Verh. Lor. 85. *L. evenius*, Bl. Fl. Jav. Loranth. t. 16, (1823?); King in Journ. As. Soc. Beng. LVI. ii. 97. *Macrosolen evenius*, Miq. Fl. Ind. Bat. I. i, 827. *Miquelina evenia*, van Tiegh. Bull. Soc. Bot. Fr. XLII. 443.

KEDAH: on Kedah Peak, *Ridley* 5485!. PERAK: *Scortechini*!; on Gunong Hijan, Gunong Bubu and Ulu Batang Padang, at about 1500 m. alt., *Wray* 645!, 1503!, 3884!. PAHANG: at Kluang Terbang, *Barnes* 10906?!.—DISTRIB. Java, Sumatra (Mt. Dempo, *Forbes* 2401!)

*Wray*, on No. 3884, says the flowers are 'very pale green', but *Miquel* describes them as red as does *Koorders*, while the plate in *Blume's Flora Javae* shows them as pale dull red. In every other respect *Wray's* specimens agree perfectly. I am rather doubtful about *Barnes* 10906 which has thinner and more acute leaves.

*Loranthus hypoglaucaus*, *Kurz* in Journ. As. Soc. Beng. II. 309 (1872) and For. Fl. II. 318; *Hook f.* Fl. Br. Ind. V. 50 may possibly be only a variety of this with leaves glaucous beneath and corolla tube a little more uniform in thickness (Pegu: Nattoung ridge, 6000 ft. *Kurz* 382!)

7. ELYTRANTHE PAPPILLOSA, *Gamble* in Kew Bull. 45 (1913). A parasitic shrub; branchlets rather slender, round, rough, pale brown. *Leaves* opposite, coriaceous; oblanceolate, rounded at apex, cuneate at base; both surfaces dull when dry and olive brown; 3—4 cm.

long, about 1—5 cm. broad; midrib slender, obscure; main nerves 1—2 pairs, from close to the base only and very oblique, scarcely visible on the lower surface; reticulation not apparent; petiole none or at least under 3 mm. long. *Flowers* yellow-orange, in very short pedunculate pairs, 1—2 together in the axils of the leaves or of fallen leaves; peduncle about 1 mm. long as are the pedicels; bract small, ovate, acute; bracteoles minute, in a 2-lobed lip. *Calyx*-tube ovoid, 2 mm long, prominently papillose, the limb a mere rim. *Corolla*-tube glabrous, cylindric in bud and 6-angled, funnel-shaped in flower, 7—8 mm. long; lobes 6, prominently papillose without, spatulate and recurved in flower, 5—6 mm. long. *Stamens* 6; anthers oblong, 1—5 mm. long; filaments slender, 5 mm. long. *Ovary* ovoid; style slender; stigma capitate. *Fruit* not known.

SINGAPORE: at Kranji, *Ridley* 2045!

8. ELYTRANTHE RETUSA, G. Don Gen. Syst. Dichl. Pl. III. 425 (1834). A parasitic glabrous shrub; branchlets stout, rough, lenticellate, greyish-brown; nodes swollen. *Leaves* opposite or sub-opposite, thickly coriaceous; obovate, elliptic or orbicular, sometimes obcordate, obtuse or retuse at apex, cuneate or attenuate at base; upper surface somewhat shining, olive-brown when dry, lower dull; margins recurved; 5—12 cm. long, 2.5—5 cm. broad; midrib rather stout, raised on both surfaces; main nerves 3—5 pairs, obscure and sometimes invisible; reticulation obscure; petiole very stout, 5—7 mm. long. *Flowers* in racemes of 5—7 up to about 1—5 cm. long, solitary or in pairs from the axils of the leaves or of fallen leaves; pedicels slender, 2—3 mm. long; bract ovate, acute, very small; bracteoles combined in a 2-toothed cup, minute. *Calyx*-tube cylindric, 2—3 mm. long, the limb a narrow entire rim. *Corolla*-tube pale rose, cylindric below, dilated below the lobes, up to 2 cm. long; lobes 5—6 usually 6, linear, reflexed in flower, 1 cm. long, yellowish-green. *Stamens* 5—6; anthers linear, slender, 3—4 mm. long; filaments broad, 5 mm. long. *Ovary* included in the calyx-tube; style slender; stigma capitate. *Fruit* globosely ovoid, 5—7 mm. long. Engl. & Prantl Naturl. Pflanzenfam. III. i. 188; Koord. Exkurs. Fl. Jav. II. 164. *Loranthus retusus*, Jack in Roxb. Fl. Ind. ed. Carey and Wall. II 212; DC. Prodr. IV. 296; Wall. Cat. 504 *in part*; Hook. f. Fl. Br. Ind. V. 219. *Macrosolen retusus*, Miq. Fl. Ind. Bat. I. i. 828; van Tiegh. in Bull. Bot. Soc. Fr. XLII. 442.

PERAK: at Lumut on *Eugenia*, *Ridley* 9432!. MALACCA: *Griffith* K. D. 2703!; *Maingay* K. D. 688!; *Cuming* 2305!; on *Dacrydium*,

Mount Ophir, *Ridley* 3160!; top of Mount Ophir, *Hullett*!. SINGAPORE: *Wallich* 504!; on *Rhodomirtus* at Changi, *Ridley* 1808!; *King's Collector* 1170!.—DISTRIB: Java, Borneo.

9. ELYTRANTHE LOWII, Gamble. A parasitic shrub; branchlets moderately stout, terete, brown, the nodes slightly swollen. *Leaves* rigid, coriaceous, opposite; ovate or lanceolate, acute or acuminate at apex, attenuately rounded at base; upper surface shining, olive-green when dry, lower dull, subglaucous; margins recurved when dry; 4—6 cm. long, 1·5—2·5 cm. broad; midrib slender, visible only on the undersurface; main nerves about 4—6 pairs, rarely at all visible; reticulation invisible; petiole stout, rugose, 3—4 mm. long. *Flowers* in 2—4-flowered racemes, scarcely 1 cm. long, in axillary clusters of 1—3; pedicels puberulous, about 3 mm. long; bract ovate, acute, 2—3 mm. long; bracteoles united in a 2-toothed cup, 1—2 mm. long, both puberulous without. *Calyx*-tube cylindric, smooth, 4 mm. long; the limb very short, truncate, waned. *Corolla*-tube curved, 6-angled and slightly inflated at the base of the lobes, 1—1·5 cm. long; lobes 6, 1 cm. long, subspathulate, thickened at the apex, reflexed in flower. *Stamens* 6; anthers oblong, 1—5 mm. long; filaments broad, 6 mm. long. *Ovary* cylindric; style filiform, nearly as long as the stamens; stigma capitate. *Fruit* not known. *Loranthus Lowii*, King in Journ. As. Soc. Beng. LVI. ii. 98 (1887).

PERAK: without locality, *Scortechini* 861!.

10. ELYTRANTHE GLOBOSA, G. Don Gen. Syst. Dichl. Pl. III. 426 (1834). A parasitic usually glabrous shrub; branchlets terete, pale brown with lenticellate bark, the nodes swollen. *Leaves* coriaceous, opposite or rarely alternate or in whorls of three; elliptic-ovate or lanceolate, sometimes more or less oblong, acuminate at apex, attenuate at base; both surfaces smooth, shining, olive brown when dry; 6—12 cm. long, 2—6 cm. broad; midrib conspicuous, impressed above; main nerves irregular, often obscure, 5—6 pairs; reticulation obscure; petiole 3—8 mm. long. *Flowers* in axillary racemes, single or in pairs or sometimes clustered, up to 2—3 cm. long; pedicels slender, 0—3 mm. long; bract ovate, acute, 2 mm. long, bracteole-cup 1 mm. *Calyx*-tube urceolate, smooth; limb cup-shaped, truncate. *Corolla* in bud linear-clavate, with folds below the lobes, when open campanulate and slightly gibbous, obtuse, 5—6 mm. long; lobes 6 or sometimes 5, linear, reflexed at the middle, glabrous without, colour varying from green to yellow, usually with purplish tips and

stripes. *Stamens* as many as the corolla-lobes; filaments slender, exsert; anthers small, the cells parallel. *Ovary* conform to the calyx-tube; style long, filiform; stigma large, capitate. *Fruit* an ovoid or globose berry, smooth or minutely dotted, reaching 5 mm. in diam., yellowish in colour, the pericarp fleshy. Engl. & Prant. Naturl. Pflanzenfam. III. i. 188; Koord. Exkurs. Fl. Jav. II. 164. *E. ampullacea*, G. Don l.c. 425. *Loranthus globosus*, Roxb. Fl. Ind. I. 550, II. 187 and ed. Carey and Wall. II. 206; DC. Prodr. IV. 297; Wall. Cat. 6870; Kurz For. Fl. II. 315; Hook. f. Fl. Br. Ind. V. 220. *L. subglobosus*, Wall. Cat. 538; DC. l.c. 297; Kurz l.c. 316. *L. oleoides*, DC. l.c. *L. oleifolius*, Wall. Cat. 524. *L. viridiflorus*, Wall. in Roxb. Fl. Ind. ed. Carey and Wall. II. 219; Wall. Cat. 512. *L. sphaerocarpus*, Bl. Bijdr. 661 and Fl. Jav. Loranth. t. 17; DC. l.c. 297; Korth. Verh. Lor. 85. *L. ampullaceus*, Roxb. l.c. 189 and 209; DC. l.c. 296; Kurz l.c. 316; Wall. Cat. 502; King in Journ. As. Soc. Beng. LVI. II. 97. *L. pallens* and *L. carinatus* Wall. Cat. 523, 529; DC. l.c. 296, 297. *L. subumbellatus*, Bl. Bijdr. 661 and Fl. Jav. Loranth. t. 17; DC. l.c. 297. *Macrosolen pallens*, *sphaerocarpus* and *oleoides*, Miq. Fl. Ind. Bat. I. i. 830, 831.

SIAMESE STATES: Trang, *King's Collector* 1398!. KEDAH: Pulau Lankawi, *Curtis* 2421!. PENANG: *Wallich* 523!, 524!; *King's Collector* 1663!. PERAK: at Tapa, *Wray* 1419!; *King's Collector* 7866!, 10697!; *Scortechini* 221!, 859!. MALACCA: *Griffith* K.D. 2704!; *Cuming* 2343!; *Maingay* K.D. 689!. SINGAPORE: *Murton* 13!; *King's Collector* 1142!; *Ridley* 403!, 2022! etc.; *Hullett* 655!.

Var. *puberula*, Gamble. Inflorescence covered with grey puberulous down; fruits rugose.

PERAK: at Kuala Kangsa, *Wray* 3355!; at Ulu Bubong, *King's Collector* 10088!; *Scortechini* 258!. TRINGGANU: at Pulau Kaltan, *Ridley*!. SINGAPORE: *Ridley* 9220!, 14173!.

11. ELYTRANTHE BARNESII, Gamble in Kew Bull. 45 (1913). A parasitic glabrous shrub (?); branchlets stout with brown rough bark, the nodes much swollen. *Leaves* coriaceous, opposite; lanceolate or oblong-lanceolate, obtusely acuminate at apex, rounded, usually unequally, at base; margins recurved; upper surface shining, lower dull, olivaceous when dry; 6—12 cm. long. 2.5—4.5 cm. broad; midrib prominent and raised on both surfaces; main nerves 7—9 pairs, nearly at right angles to the midrib, curved near the margin, reticulation not visible; petiole stout, 5—7 mm. long. *Flowers* in 4—5-flowered glabrous racemes about 12—15 mm. long, clustered

many together on the enlargement of the nodes in the axils of the leaves and at the ends of the branchlets; pedicels slender, 1·5—2 mm. long; bract ovate-acute, the bracteoles similar and nearly free. *Calyx*-tube ovoid, vertically channelled; limb 1 mm. long, truncate. *Corolla* in bud clavate, angled below the lobes, 8 mm. long; when open the 6 lobes linear acute, reflexed from about the middle (?). *Stamens* 6; anthers oblong, 1·25 mm. long; filaments 3·5 mm. long. *Ovary* ovoid; style slender, slightly angled; stigma obtuse or emarginate. *Fruit* not known.

PAHANG: at Kluang Terbang, *W.D. Barnes* 10905!

12. *ELYTRANTHE ROBINSONII*, Gamble in *Kew Bull.* 45 (1913). A parasitic shrub growing on trees; branches stiff, with greyish-brown thin bark; branchlets slender, wiry, the uppermost somewhat angular when dry; all parts glabrous. *Leaves* coriaceous, opposite or sub-opposite; narrowly lanceolate, acuminate at apex and at base; upper surface red, lower dull green when fresh, upper olivaceous, shining, lower ferruginous-brown and dull when dry; 5—8 cm. long, 1—2·5 cm. broad; midrib slender, prominent on both surfaces; main nerves indistinct, 3—5 pairs, irregular, very oblique and speedily disappearing; reticulation obscure; petiole 3—4 mm. long, bordered by the decurrent margins of the blade. *Flowers* small, bright orange red, in nearly sessile fascicles of 1—3-flowered racemes scarcely 5 mm. long in the axils of the leaves or of the scars of fallen leaves; pedicels very short; bract ovate, acute; bracteoles combined in a bifid lip. *Calyx*-tube ovoid, 2 mm. long, the limb truncate, entire or very slightly lobed. *Corolla* in bud clavate, 5—6 mm. long, angled below the lobes; lobes 6, linear-lanceolate, as long as the tube. *Stamens* 6: anthers very small, 0·5 mm. long, the filaments 1·5 mm. long. *Ovary* ovoid; style slender; stigma small, obtuse. *Fruit* not known. *Loranthus globosus*, Ridley in *Journ. Linn. Soc.* XXXVIII. 321 *not of Roxb.*

PAHANG: on Gunong Tahan, 1200—1500 m. alt., *Wray and Robinson* 5404!

13. *ELYTRANTHE DIANTHA*, Gamble. A parasitic shrub, reaching 1 m. in height, quite glabrous; branchlets slender, terete, with pale brown bark, the nodes swollen. *Leaves* opposite, thinly coriaceous; lanceolate or rarely ovate-lanceolate, long acuminate at apex, rounded or very shortly attenuate at base; both surfaces olive-green and somewhat shining when dry; margins slightly recurved;

8—15 cm. long, 2—6 cm. broad; midrib slender, raised on both surfaces; main nerves 4—6 pairs, irregular, oblique, slightly raised above; reticulation also slightly raised when dry, areolate; petiole rather slender, 4—6 mm. long. *Flowers* in pairs in the excavations of a very short peduncle, each with an ovate-acute bract 2 mm. long at the base; bracteoles united in a thick cup 2—3 mm. long, cleft at the outer margin opposite the bract and embracing the base of the calyx-tube. *Calyx-tube* smooth, cylindric, the limb short, truncate. *Corolla* deep red, curved, narrowly tubular, inflated and boldly 6-angled just under the limb, clavate in bud, 5 cm. long; lobes 6, twisted, reflexed, oblanceolate, 2 cm. long, thickened within in a flattened ridge, green with purple margins. *Stamens* 6, lemon-yellow: anthers linear, 5—6 mm. long; filaments 7 mm. long, green. *Ovary* cylindric; style filiform; stigma capitate. *Fruit* globular, smooth, 10—12 mm. in diam., crowned by the calyx-limb. *Loranthus dianthus*, King and Scort. M.S.; King in Journ. As. Soc. Beng. LVI. ii. 96 (1887). *Blumella diantha*, van Tiegh. in Bull. Soc. Bot. Fr. XLII. 441.

PERAK: near Larut, *Scortechini* 76!, 604!; at Relan Tujur, *Wray* 1785!, 2210!; on trees in open forest up to 250 m. alt., *King's Collector* 1870!, 6446!.

14. ELYTRANTHE WRAYI, Gamble in Kew Bull. 46 (1913). A parasitic shrub; branchlets stout, terete, with pale brown bark, the nodes swollen. *Leaves* opposite, thickly coriaceous; oblong-lanceolate, obtuse or obtusely acute, sometimes obtusely acuminate at apex, attenuate and often unequal at base; both surfaces green tinged with red when fresh, smooth and olive-green when dry; 10—13 cm. long, 3—7 cm. broad; midrib stout, raised on both surfaces; main nerves 5—6, irregular, oblique, joined by a faint often obscure reticulation; petiole 0—10 mm. long, bordered by the decurrent margins of the blade. *Flowers* in pairs in the excavations of a short thick axillary peduncle, each flower subtended by a broadly ovate horizontal bract 3.5 mm. long; bracteoles united in a thick truncate cup 3 mm. long, cleft at the outer margin opposite the bract and embracing the calyx-tube; peduncle 3 mm. long, thick. *Calyx-tube* smooth, cylindric, 3—4 mm. long, the limb also cylindric, truncate, 4—6 mm. long. *Corolla-tube* red passing into green below the lobes, curved, narrowly tubular, inflected below the lobes and 6-angled, clavate in bud, 4—5 cm. long; lobes 6, yellow bordered with red, narrowly lanceolate, acute at apex, broadened out at base,

thickened in a ridge within, twisted and reflexed in flower, 1.5—2 cm. long. *Stamens* 6; anthers linear, acute at apex, slightly spurred in front at base, 7—8 mm. long; the filaments as long. *Ovary* short, cylindrical; style slender, geniculate below the top; stigma obliquely capitate. *Fruit* not known.

PERAK: in Upper Perak at 300 m. alt., *Wray* 3770!

#### 4. LEPEOSTEGERES, Blume.

Parasitic shrubs. *Leaves* coriaceous, entire, exstipulate, opposite or sub-opposite. *Inflorescence* consisting of a sessile capitulum surrounded by sheathing imbricate involucreal bracts, gradually lengthening upwards and sometimes with an inner series; flowers in each capitulum few—many, sessile on a flattened receptacle; bract to each flower 0; bracteoles 0—4, often elongate. *Calyx*-tube short, cylindrical or angular, the limb entire or shortly lobed. *Corolla*-tube elongate sometimes cleft to the base, slender, the 5—6 lobes reflexed when open. *Stamens* 5—6 inserted at the mouth of the corolla-tube; anthers basifixed, linear or subulate; filaments slender. *Ovary* included in the calyx-tube; style filiform; stigma subclavate. *Fruit* as in *Loranthus*, etc.—DISTRIB. Malay Peninsula and Archipelago.

Bract and bracteoles of the flower absent; inflorescence up

to 15 cm. long; corolla-tube very narrow, lacinate .. 1. *L. Beccarii*.

Bract none, bracteoles 4 up to 2 cm. long; inflorescence up

to about 6 cm. long; corolla-tube funnel-shaped, split on

one side .. .. . 2. *L. Kingii*.

1. *LEPEOSTEGERES BECCARII*, Gamble. A glabrous parasitic shrub, the branches often very long, otherwise about 60—90 cm. high; branchlets stout, terete, greyish-brown, the younger quadrangular (at least when dry); nodes swollen. *Leaves* thin coriaceous, opposite or sub-opposite; from ovate-lanceolate or ovate-oblong to suborbicular, very variable even on the same plant, subacute or obtuse at apex, cuneate or rounded at base; both surfaces dull, bluish-green when dry; 6—12 cm. long, 3—7 cm. broad; midrib fairly stout, scarcely visible on the upper surface; main nerves about 6 pairs, oblique, indistinct; secondary nerves occasional, obscure as is the reticulation; petiole moderately stout, 2—3 cm. long. *Inflorescence* lateral, from nodes on the old wood, of 20—30-flowered densely involucreate sessile capitula, subglobose when young, afterwards strobiliform and much elongate (up to 15 cm.); involucreal bracts large, numerous, imbricate, pale red, oblong to semi-

orbicular, obtuse, the inner 5—8 cm. long, the outer gradually shorter; receptacle obconic, flattened, bearing the closely packed sessile flowers; bracts and bracteoles to the flowers none. *Calyx*-tube angular, 4—5 mm. long, truncate, the limb a mere rim. *Corolla*-tube deep claret-colour, very slender, 7—10 cm. long, splitting into 6 very narrow linear yellow segments which are united for about 1 cm. at base and again slightly just below the twisted reflexed linear obtuse lobes, the lobes about 2 cm. long. *Stamens* 6; anthers linear, acuminate, very narrow, 12 mm. long, the cells lateral; filaments slender, 10 mm. long. *Ovary* cylindrical, rounded at top; style filiform; stigma small, rounded. *Fruit* subangular, globose, 8 mm. in diam. *Loranthus Beccarii*, King in Journ. As. Soc. Beng., LVI. ii. 98 (1887). *Stegastrum Beccarii*, van. Tiegh. in Bull. Soc. Bot. Fr. XLII. 447. *Elytranthe Beccarii*, Engl. in Engl. & Prantl Nachtr. (1897) 126.

PERAK: at Gunong Ijuk, *Scortechini* 1208!; on the branches of trees at elevations up to 600 m. alt., *King's Collector* 5793!, 7956!; at Bujong Malacca, *Ridley* 9577!.—DISTRIB. Borneo (*Beccarii* 1171; *Haviland* 3642!).

2. *LEPEOSTEGERES KINGII*, Gamble. A parasitic shrub; branchlets stout, terete, with smooth pale brown bark, the younger ones slightly lenticellate; nodes swollen. *Leaves* coriaceous, opposite; ovate-lanceolate, obtusely acuminate at apex, rounded and often unequal at base; both surfaces olive-green when dry, rather dull, smooth; 7—15 cm. long, 4—8 cm. broad; midrib stout, prominent; main nerves apparently 6—7 pairs, usually quite invisible on either surface as is the reticulation; petiole very stout, 1—2 cm. long. *Inflorescence* axillary, from new wood, of 4—6-flowered densely involucrate sessile capitula, up to about 6 cm. long, prominently 4-angled when young and strobiliform, afterwards elongate; involucre bracts large, red, keeled, the outer series of 6—7 decussate pairs, the uppermost of which are linear-oblong, obtuse, 3—4 cm. long, the lower gradually smaller and more acute, the inner series of a single lanceolate pair 2—2.5 cm. long; receptacle flattened, bearing the sessile flowers each of which has 4 linear-lanceolate acute keeled bracteoles about 2 cm. long. *Calyx*-tube angular, 2—3 mm. long, the limb unequally 6-toothed. *Corolla*-tube narrowly infundibuliform, 3—4 cm. long, curved below the middle, split nearly  $\frac{1}{2}$ -way down on one side and cleft at the apex into 5—6 lanceolate acuminate teeth which are at first reflexed and twisted and then upright and 1—1.5 cm. long.



*Stamens* 5—6; anthers subulate, acuminate, 5 mm. long, with a slight process at their bases; filaments as long as the anthers. *Ovary* cylindrical; style filiform, as long as the stamens; stigma small, subcapitate. *Fruit* ovoid, elongate, crowned by the remains of the calyx-tube. *Loranthus Kingii*, Scortechini ex King in Journ. As. Soc. Beng. LVI. ii. 99 (1887).

PERAK: at Gunong Ijuk, *Scortechini* 1251!; camp on Ulu Batang Padang, 1500 m. alt., *Wray* 1526!. PAHANG: at Kwala Tenoh, Sunjie Tahan river, *Ridley's Collector* 2249!. MALACCA: *Maingay* K.D. 695!; at Selandan, *Ridley* 10771!; at Bukit Sedanan, *Goodenough* 1451!.

Goodenough says the flower is striped white and red, *Ridley's Collector* says, 'bright red with yellow-orange stripes,' *Ridley* and *Wray* say, 'red,' but the material seems to me to belong all to the same species though *Sir G. King* has named some of the sheets *L. Forbesii*. Stapf in Trans. Linn. Soc. Ser. 2. IV. 222 under his *Loranthus sabaensis* a species from over 3000 m. alt. on Mount Kinabalu in Borneo, doubts if *Maingay's* 695 really is *Scortechini's* plant. From the (only meagre) specimens of the type that I have examined I think it must be, but it is quite clear that further investigation on the spot is needful to clear up the point.

#### 5. GINALLOA, Korth.

Parasitic shrubs, growing on trees; branches dichotomous or whorled, jointed at the nodes, bearing, just above each node, a sheath-like thickening ending in a free ring. *Leaves* opposite, coriaceous. *Flowers* monœcious, in triads in terminal and axillary jointed spikes; bracts connate, cup-shaped, at the base of each joint of the spike, broadened in alternate spikes. *Perianth-tube* in ♂ 3-lobed, the lobes triangular-ovate, thick; in ♀ oblong, also 3-lobed, the lobes smaller and thinner. *Stamens* 3, opposite the perianth-lobes; filaments very stout, short; anthers ovoid, 2-celled, the cells opening by introrse longitudinal or curved slits. *Ovary* conform to the perianth-tube which encloses it; style none; stigma capitate; ovules 1—2. *Fruit* a 1-seeded berry; pericarp leathery enclosing a viscous layer surrounding the seed; perianth lobes persistent. *Seed* ovoid; testa thin; albumen fleshy, bearing the embryo at its apex; cotyledons very small; radicle minute, superior.—DISTRIB. Malay Peninsula, Andaman Islands and Ceylon (according to van Tieghem 9 sp.).

##### 1. GINALLOA SIAMICA, Craib in Kew Bull. 455 (1911).

Var. *Scortechinii*, Gamble. *Branchlets* terete, rather stout, the sheath-like thickening about 8 mm. long. *Leaves* very coriaceous,

ovate or ovate-oblong, somewhat falcate, obtusely acute at apex, unequally rounded or attenuate at base; 5—8 cm. long, 2—5 cm. broad; ribs 3, faint, other nerves and reticulation invisible; petiole stout, up to 7 mm. long, gradually broadening to the base of the blade. *Spikes* terminal, 5 cm. long or more; bracts joined in a cup embracing the rachis. *Flowers*: ♂ not known, ♀ with 3 minute perianth-lobes surmounting the oblong perianth-tube enclosing the fruit.

PERAK: ? *Scortechini*!

Only one sheet of this interesting plant is available and the material is very scanty. The branchlets and leaves resemble those of *G. siamica*, but that species has 5 nerves to the leaves; it is close enough, however, to be considered a 3-nerved variety and when more material is available it may prove to be a distinct species.

#### 6. KORTHALSELLA, van Tiegh.

Leafless parasitic shrubs, the branches jointed, furnished with bracteate scales at the joints, the joints all in the same plane. *Flowers* in the axils of the scales, monœcious, surrounded by tufts of hair, ♂ and ♀ with 3 perianth-lobes which are persistent after flowering in ♀. *Anthers* 3, 2-celled, cells opening by longitudinal slits introrsely but the anthers being connected at their margins the pollen issues by a central aperture. *Ovary* obovoid, placenta central, embryo basal, stigma small. *Fruit* an obovoid berry, the seed albuminous.—*DISTRIB.* India and Malaya, species according to van Tieghem, 61 (*Bifaria*); according to Engler much fewer.

1. KORTHALSELLA JAPONICA, Engl. in Engl. & Prantl Naturl. Pflanzenfam. Nachtr. 138 (1897). A small tufted leafless parasitic shrub, yellow or brown when dry, reaching scarcely 15 cm. in height; branches flattened, contracted at the nodes, the internodes variable in length and breadth reaching 2—5 cm. in length and 5 mm. in breadth, obovate in shape and usually strongly keeled, not twisted but all in one plane. *Flowers* very minute, in dense clusters fascicled in cup-shaped bracts at the tips of the internodes and surrounded at base by short erect hairs, ♂ very few; perianth lobes 3, triangular, acute, concave, persistent in ♀. *Berry* ellipsoid or obovoid, 2—5 mm. long, fleshy. *Viscum japonicum*, Thunb. in Trans. Linn. Soc. II. 329 (1794); DC. Prodr. IV. 283; Hook. f. Fl. Br. Ind. V. 226; Trimen Fl. Ceyl. III. 472; Collett Fl. Siml. 440; Brandis Ind. Trees 552. *V. opuntia*, Thunb. Fl. Jap. 64. *V. articulatum*, Miq. Prol. Fl.

Jap. 297; Benth. Fl. Hongk. 141 and Fl. Austral. III. 396; Brandis For. Fl. 393 (not of Burm.). *V. moniliforme*, Wt. & Arn. Prodr. 380; Wight Ic. t. 1018 and Spic. Neelgh. t. 87; Kurz For. Fl. II. 325 (not of Bl.). *V. Wightianum*, Wall. Cat. 6877 (not of Wt. and Arn.).

KEDAH: on Gunong Jerai, *Ridley!*. MALACCA: on Mount Ophir, *Ridley* 3161!—DISTRIB.: India, Ceylon, China, Japan, Australia.

I have been unable to ascertain to which of his many species of BIFARIA the Malay Peninsula form of the old *Viscum japonicum* is attributed by van Tieghem. His *B. japonica* is restricted to the Japanese plant first collected by Thunberg in 1794: see Bull. Soc. Bot. Fr. XLIII. 173 (1896).

### 7. VISCUM, L.

Parasitic shrubs, growing on trees; branches usually di-trichotomous, sometimes whorled, jointed, the internodes terete angular or flattened. *Leaves* opposite, flat and thick or reduced to small scales, coriaceous. *Flowers* unisexual, small, fasciculate or solitary or usually in triads, in the axils of the leaves or at the nodes of the branches, rarely terminal; bracts small; bracteoles 2, free or connate in a cup. *Perianth-tube* in ♂ solid, in ♀ adnate to the ovary; lobes usually 4, very short, ovate or triangular. *Stamens* as many as the perianth-lobes and adnate to them, dehiscent introrsely by numerous pores. *Ovary* inferior, 1-celled; ovules solitary or paired; stigma sessile or subsessile. *Fruit* a succulent berry with soft viscid mesocarp. *Seed* adnate to the pericarp; albumen copious, solid; embryo terete, enclosed in the albumen, solitary or 2 to each seed. DISTRIB.: Temperate and tropical regions, species about 30.

Leafy shrubs, perianth-lobes deciduous (Sect. I. PLOIONIXIA, Korth.)

Leaves thin, ovate or lanceolate, often falcate, acuminate at apex; involucre bracteoles acuminate, lateral flowers of triads ♀, central ♂ . . . 1. *V. monoicum*.

Leaves thick, obtuse at apex; involucre bracteoles obtuse, lateral flowers of triads ♂, central ♀.

Upper internodes cylindric, striate; leaves coriaceous, more or less oblong; berry warted . . . 2. *V. orientale*.

Upper internodes alternately flattened; leaves very coriaceous, obovate; berry smooth . . . 3. *V. Wrayi*.

Leafless shrubs, perianth-lobes apparently persistent (Sect. II. ASPIDIXIA, Korth.)

Articles 4–10 mm. broad; flowers comparatively large, in many fascicles; berry 5 mm. in diam . . . 4. *V. dichotomum*.

Articles 2–4 mm. broad; flowers very minute in few fascicles; berry about 3 mm. in diam. . . . 5. *V. articulatum*.

Articles 2 mm. broad; flowers very minute, in few fascicles; berry 2.5 mm. in diam. . . 6. *V. flexuosum*.

1. *VISCUM MONOICUM*, Roxb. Fl. Ind. III. 763 (1832). A parasitic shrub with numerous dichotomous or opposite branches; branchlets terete, slender, slightly thickened at the nodes, furrowed when dry. *Leaves* opposite, thinly coriaceous; ovate or lanceolate, often falcate, more or less acuminate at apex, attenuate at base; both surfaces glabrous, nearly black when dry; 3—5 cm. long, 1—2 cm. broad; 3—5-ribbed, the outer ribs slightly pedate; nerves few, reticulate; petiole none or very short. *Flowers* monœcious, in axillary sessile or very shortly (1 mm.) peduncled clusters of 1—3, supported by two ovate acuminate bracteoles combined in a shallow cup, the outer flowers of triads ♀ the central one ♂ or wanting; perianth 4-lobed, the lobes ovate—acute, those of the ♂ bearing the sessile anthers. *Ovary* oblong; style 0; stigma very short, conical. *Fruit* an oblong, smooth yellowish berry, truncate at apex. DC. Prodr. IV. 278; Brandis For. Fl. 393 and Ind. Trees 552; Wt. & Arn. Prodr. 379 (in note under *V. orientale*); Griff. Notul. IV. 637 and Ic. Pl. Asiat. t. 631; Kurz For. Fl. II. 324; Hook. f. Fl. Br. Ind. V. 224. Cooke Fl. Bomb. II. 552; Trimen Fl. Ceyl. III. 471; Prain Beng. Plants 912. *V. falcatum*, Wall. Cat. 492; DC. lc. *V. confertum*, Roxb. l.c. *vide* Wt. & Arn. *V. bengalense*, Roxb. Ill. in Herb. Kew. t. 1181.

SIAMESE STATES: Kasoom, Curtis 3265!.—DISTRIB. India, Burma, Ceylon.

2. *VISCUM ORIENTALE*, Willd. Sp. Pl. IV. 737 (1805). A parasitic shrub with numerous dichotomous or opposite branches; branchlets terete or angular and grooved, glabrous, the ultimate ones often very slender; nodes thickened. *Leaves* opposite, fleshy-coriaceous; obovate or elliptic-oblong or -lanceolate or linear-oblong, obtuse at apex, attenuately narrowed at base; both surfaces glabrous, black or brown when dry, 2—7 cm. long, 1—2.5 cm. broad; 3—5-ribbed, the outside ribs slightly pedate, often very short, and often looped above; nerves few, irregular, transverse; reticulation obscure; petiole none or very short. *Flowers* monœcious, in axillary, sessile or peduncled, clusters of 1—3, supported by two ovate bracts which are combined in a boat-shaped involucre; when in threes the central flower usually ♀, the outer ones much smaller and ♂, sometimes all ♂ or reduced to only one ♀; perianth 4-lobed, the lobes triangular, 1—5 mm. long in ♂, 1 mm. in ♀, in ♂ flowers one pair slightly larger than the other. *Anthers* 4, sessile by their connectives, often one pair larger than the other and more obtuse,

pores rather few. *Ovary* ovoid, stipitate, truncate; style short, conical; stigma capitate. *Berry* ovoid or subglobose, purplish red, rather prominently warted, as large as a pea, sessile or more or less stalked, the stalks up to 1—2 mm. long, thick. DC. Prodr. IV. 278; Wt. & Arn. Prodr. 379; Bl. Bijdr. 666 and Fl. Jav. Loranth. tt. 24, 25; Benth. Fl. Austral. III. 396; Wall. Cat. 491; Brandis For. Fl. 393 and Ind. Trees 552; Kurz For. Fl. II. 324; Hook. f. Fl. Br. Ind. V. 224; Cooke Fl. Bomb. II. 552; Trim. Fl. Ceyl. III. 471; Prain Beng. Plants 912; Miq. Fl. Ind. Bat. I. i. 804; Koord. Exkurs. Fl. Jav. II. 166. *V. verticillatum*, Roxb. Fl. Ind. III. 764.

PERAK: at lower camp, Gunong Batu Pateh, *Wray* 1074!; tea gardens, *Ridley*!. PAHANG: at Pulau Jellam, *Ridley* 2250!. MALACCA: at Merliman, *Derry* (?) 195!. SINGAPORE: *Ridley* 1827!, 3777!, 6816!, 10369!. 11392!.—DISTRIB. India, Burma, Ceylon, Java, Borneo (*Haviland* 3092!), China, New Guinea, Australia.

Var. *ovalifolium*, Miq. Fl. Ind. Bat. I. i. 805. *Leaves* larger, up to 8 cm. long, 5 cm. broad, often paler when dry, the 3 middle ribs prominent, the two side ones short and faint; flowers solitary in the involucre and more numerous and in closer fascicles in the leaf-axils; stigma shorter and broader. *V. ovalifolium*, Wall. Cat. 489; DC. Prodr. IV. 278; Kurz For. Fl. II. 325; Hook. f. Fl. Br. Ind. V. 225. *V. obtusatum*, Wall. Cat. 494; DC. l.c. 279.

KEDAH: at Pulau Songsong, *Curtis* 2599! PENANG: *Wallich* 489!; Penang Hill, *Ridley* 9373! PERAK: *Scortechini* 732!. MALACCA: *Griffith* K.D. 2739!, 2740!; *Cuming* 2341!; at Tanjong Kling, *Ridley* 3162!.—DISTRIB. Burma, Andamans, Siam (*Kerr* 818!).

3. *VISCUM WRAYI*, King M.S. in Herb. Calc. ex Gamble in Kew Bull. 47 (1913). A parasitic shrub with rather stout dichotomous or opposite branches; branchlets terete, the uppermost with the internodes more or less flattened in alternate directions; nodes only slightly swollen. *Leaves* opposite, thickly fleshy-coriaceous, light yellowish green when fresh, nearly black when dry; obovate, rounded or slightly emarginate at apex, cuneate at base; both surfaces glabrous, slightly shining; margins recurved; 3—4.5 cm. long, 1—3 cm. broad; ribs 5, the outer ones pedately inserted, only slightly visible on the undersurface; other nerves and reticulation obscure; petiole 0. *Flowers* in axillary, shortly pedunculate, clusters of 1—3 supported by 2 connate ovate bracteoles forming a boat-shaped involucre, the middle flower ♀ on a 1 mm. long pedicel, the

two outer ♂ sessile; perianth 4-lobed, lobes ovate, acute, those of ♂ rather larger than those of ♀ and 1 mm. long. *Anthers* 4, sessile by their connective, with few (about 6–7) circular pores. *Ovary* oblong, contracted below the truncate mouth; stigma conical. *Berry* ovoid, pale green, truncate at apex, smooth, 5 mm. in diam.; seed ellipsoid, embryo oblique.

KEDAH: on Kedah Peak, *Ridley* 5847!. PERAK: at lower camp. Gunong Batu Putih *Wray* 1111!.

The anthers in this species, at any rate in the specimens available, are very difficult to make out. They seem at first sight to open longitudinally, but a high power shows the minute pores.

4. VISCUM DICHOTOMUM, D. Don Prodr. Fl. Nep. 142 (1825). A leafless pendulous much di-trichotomously branched parasitic shrub, yellow or brown when dry; branches terete, branchlets jointed at the nodes and easily separating when dry, the internodes (articles) flattened, longitudinally (about 5–9-) ribbed, slightly narrowed above attenuate below, each article at right angles to its neighbour but twisted near the base so that all appear to be in one plane; 1.5–4 cm. long, 4–10 mm. (–15 mm. *Koord.*) broad. *Flowers* small, in axillary fascicles of 1–3, when 3 the central flower of the triad usually ♀ the outer ones ♂, triads supported by a pair of connate cup-shaped bracts, the ♀ again bibracteolate the bracteoles 1.5 mm. long; perianth lobes 4, ovate, 1.5–2 mm. long, those of ♂ spreading those of ♀ erect usually deciduous. *Anthers* adnate to the middle of the perianth-lobes, one pair rather larger than the other and more obtuse, pores rather large and conspicuous. *Ovary* cylindrical, smooth, truncate; stigma capitate. *Berry* globular, dull white, smooth, 5 mm. in diam.; seed rugose. DC. Prodr. IV. 284; Engl. & Prantl Naturl. Pflanzenfam. Nachtr. 140. *V. articulatum*, Burm. var. *dichotomum*, Kurz For. Fl. II. 325; Hook. f. Fl. Br. Ind. V. 226; Cooke Fl. Bomb. II. 553. *V. articulatum*, Collett Fl. Siml. 440, t. 143. *V. elongatum*, Wall. Cat. 495; DC. l.c. *V. opuntioides*, Willd. Sp. Pl. IV. 740; Roxb. Fl. Ind. III. 764; Wall. Cat. 496.

PROVINCE WELLESLEY: at Tassik Glugor, *Curtis*!. PERAK: up to 100 m. alt., *King's Collector* 4191!; at Simpang, *Wray* 2023!; *Scortechini* 603!. MALACCA: *Griffith* K.D. 2742!; *Hervey*!. JOHORE: at Bukit Imlyn, *Ridley*!.—DISTRIB. India, Burma.

I have thought it best to follow Engler in retaining this species, not only on account of the broader articles of the stem for these vary very much, but on account of the larger and more conspicuous flowers and fruits.

5. *VISCUM ARTICULATUM*, Burm. Fl. Ind. 311 (1768). A leafless pendulous much di-trichotomously or verticillately branched parasitic shrub nearly black when dry; branches terete, branchlets jointed at the nodes and easily separating when dry, the internodes (articles) flattened, longitudinally (about 5-) ribbed and narrowed at the ends, each article at right angles to its neighbour, but twisted near the base so that all appear to be in one plane, 1.5—3.5 cm. long, 2—4 mm. broad. *Flowers* very minute, in axillary fascicles (often only one) of triads of which the central flower is usually ♀ the outer ones ♂, triads supported by a pair of connate cup-shaped bracts, the ♀ again bibracteolate, the bracteoles 1 mm. long; perianth-lobes 3—4, triangular, acute, persistent, those of ♂ reflexed, those of ♀ erect. *Anthers* adnate to the bases of the perianth-lobes, at first joined in a central mass, afterwards separate and with very minute pores. *Ovary* cylindric, smooth; stigma small, rounded. *Berry* globular, smooth, glassy-white or yellowish, about 3 mm. in diam. DC. Prodr. IV. 284; Miq. Fl. Ind. Bat. I. i. 806; Kurz. For. Fl. II. 305 (*excl.* citation of Brandis For. Fl.); Hook. f. Fl. Br. Ind. V. 226; Engl. & Prantl Naturl. Pflanzenfam. Nachtr. 140; Koord. Exkurs. Fl. Jav. II. 167; Cooke Fl. Bomb. II. 553. *V. fragile*, Wall. Cat. 498 B. *V. compressum*, Poir. Encycl. Suppl. II. 861; DC. l.c.; Blume Fl. Jav. Loranth. t. 24. *V. aphyllum*, Griff. Notul. IV. 634 and Ic. Pl. Asiat. t. 630.

PENANG: on Penang Hill, *J. Scott!*; at 300—750 m. alt., *King's Collector* 1686!; on Government Hill, *Curtis* 2151!. MALACCA: *Maingay* K.D. 697!; *Cuming* 2258!. SINGAPORE: at Chanchukang, etc., *Ridley* 8054!.—DISTRIB. India, Burma, Java.

6. *VISCUM FLEXUOSUM*, King M.S. in Herb. Calc. ex Gamble in Kew Bull. 47 (1913). A leafless pendulous much di-trichotomously branched parasitic shrub reaching 2—3 ft. in length, olive brown when dry; branches terete, yellowish; branchlets very slender, jointed at the nodes, the internodes (articles) slightly flattened, longitudinally 1—3-ribbed, linear, scarcely attenuate, each article at right angles to its neighbour but twisted so that all appear to be in one plane; 1.5—2.5 cm. long, 2 mm. broad. *Flowers* minute, in axillary pairs of triads or single, the triads supported by a pair of connate shallow bracts and consisting of a central ♀ flower and two outer flowers of which one or both ♂; the ♀ again bibracteolate, bracteoles .75 mm. long; perianth lobes 3—4, exceedingly minute, scarcely .25 mm. longer in ♀ less in ♂, erect, deciduous. *Anthers*

adnate to the perianth lobes, pores very minute. *Ovary* ovoid, smooth, truncate; stigma very small, rounded. *Berry* globular, glassy white, 2.5 mm. in diam.

SINGAPORE: *King's Collector* 1187!; Tauglin, etc., *Ridley* 6018!, 8912!; *Murton* 151!.

#### 8. NOTOTHIXOS, Oliver.

Parasitic hoary or tomentose shrubs, growing on the branches of trees or on other *Loranthaceae*; branches dichotomous. *Leaves* opposite, flat, more or less coriaceous, ribbed. *Flowers* minute, monoecious, in terminal spikes or sessile and uniseriate in a row of 3—7 on the margins of a flattened receptacle supported by a pair of small bracts, the said receptacles pedunculate, single or in threes or more in a cyme in the forks of the branchlets; sometimes the ♂ flowers in separate heads near the ends of the branchlets, the ♀ flowers in separate heads lower down, sometimes ♂ and ♀ mixed in the same row. *Perianth-tube* in ♂ short and solid, in ♀ adnate to the ovary; lobes 4 rarely 3 or 5, small, triangular, valvate. *Stamens* in ♂ flowers attached to the bases of the perianth lobes around the sinuate margins of a flattened disk; filaments short or none; anthers erect, broad, dehiscing introrsely by circular pores. *Ovary* in ♀ flowers inferior, crowned by a fleshy disk; stigma subsessile; ovule solitary, at first not apparent. *Fruit* a 1-seeded berry, the pericarp viscid within. *Seed* oblong, on a basal cup-shaped placenta; testa very thin; embryo pendulous in a fleshy albumen, the radicle thickened, the cotyledons short, linear. **DISTRIB:** Ceylon, Malaya and Australia; species about 5.

Branchlets, leaves and inflorescence covered with golden

mossy tomentum .. .. . 1. *N. subaureus*.

Branchlets, leaves and inflorescence covered with greyish-

tawny stellate tomentum .. .. . 2. *N. Malayanus*.

1. NOTOTHIXOS SUBAUREUS, Oliv. in Journ. Linn. Soc. VII. 103 (1864). A parasitic shrub, the young parts, inflorescence and under surface of the leaves densely covered with a golden mossy floccose tomentum; branchlets terete, yellow, striate when dry, the nodes swollen. *Leaves* ovate or elliptic-ovate or ovate-lanceolate, obtuse or acute at apex, narrowed at base; upper surface shining, lower densely stellately floccose-tomentose; variable in size, 2—6 cm. long, 1—3.5 cm. broad; 3-ribbed from the base, the nerves and reticulation not visible; petiole 0—3 mm. long. *Heads* usually 5- or



more-flowered, the flowers uniseriate, usually 1 flower only ♂ the rest ♀; bracts ovate acute; peduncle 4—5 mm. long, often secund. *Perianth*-lobes triangular, usually 4. *Stamens* exceedingly minute, filaments as long as the broadly ovate obtuse anthers which open by about 5—7 pores. *Berry* ovoid-oblong, densely floccose-tomentose. Benth. Fl. Austral. III. 397. *Viscum subaureum*, F. Muell. in Herb. Hook.

PERAK: at Logon, *Herb. Mus. Perak (Scortechini?)!*.—DISTRIB. Australia, New Guinea (*H. O. Forbes 779!*).

2. NOTOTHIXOS MALAYANUS, Oliv. in Hook. Ic. Plant. t. 1519 (1886). A parasitic shrub, the young parts, inflorescence and under surface of leaves covered with a greyish-tawny tomentum of more or less stellate hairs; branchlets terete, the bark with prominent longitudinal cracks; the nodes flattened. *Leaves* obovate or suborbicular, rounded and slightly apiculate at apex, attenuate at base; upper surface dull, lower tomentose; 2—4 cm. long, 1—2.5 cm. broad; 3-ribbed from the base, the nerves and reticulation not visible; petiole 0—4 mm. long. *Heads* usually 5—7-flowered, the flowers uniseriate; usually 1—2 flowers only ♂ the rest ♀; bracts minute, ovate, acute; peduncle 4 mm. long, erect. *Perianth*-lobes 4, triangular-ovate. *Stamens* very minute; filaments very short; anthers broadly ovate, obtuse, opening by a circle of pores near the margins. *Berry* ovoid-oblong, stellate-tomentose.

PENANG: at Tulloh Babang, *Curtis 233!*.